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ABSTRACT

This report summarizes the proceedings and presents the papers discussed at a national conference on effective aspects of urban education. The first paper discusses the development of the San Francisco (California) Redesign Program, a five year master plan for educational reform which aimed to improve the physical educational environment, community relations, school attendance, and academic performance. A second paper discusses educational improvement efforts in Oakland (California) and in Chicago (Illinois) through the initiation of clearly stated academic goals, a well defined curriculum, and anti-vandalism programs. Another paper describes techniques undertaken by the Baltimore (Maryland) Public Schools to raise students' achievement levels on standardized tests by improving skills in reading, writing, and mathematics. A fourth paper describes the development of technology in American education and concludes that computers provide the means to develop alternative structures needed to decentralize the present educational system. The factors identified in the papers as influential in making urban schools effective include: cooperative involvement of school staff, students, parents, and the community in educational improvement; the adoption of a comprehensive evaluation system; the use of technology, especially the computer, to improve instruction; and staff development for higher quality instruction. (Author/MJL)

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Proceedings

The Second Conference of the University/Urban Schools National Task Force: What Works in Urban Schools

March 26 & 27, 1982
Bermuda

Edited by
Richard M. Bossone

Center for Advanced Study in Education
The Graduate School and University Center
of the City University of New York

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INTRODUCTION

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At the Second National Conference of the University/Urban Schools National Task Force, four papers were presented and discussed. Three of the papers were presented by superintendents of the San Francisco, Chicago, and Baltimore Public Schools. The information contained in these three papers is consistent with a major goal of the Task Force: to share information about what works in urban education. The fourth paper was presented by Dr. Patrick Suppes of Stanford University. The ideas contained in Dr. Suppes' paper are consistent with another major goal of the Task Force: to provide increased opportunities for dialogue between university faculty and administrative leaders of our urban schools.

Fred M. Hechinger of The New York Times also attended the conference and reported on his perceptions of the Task Force in his column "About Education," which appeared in The New York Times on April 6, 1982. Mr. Hechinger's perceptions were based largely on his understanding of the common elements of the approaches and strategies described by the superintendents. Five common features, all of which are likely associated with increased school and instructional effectiveness, can be identified. This introduction describes each of these features.

Appropriate illustrations from each of the four presentations are included in the discussion, and an overall summary statement concludes the introduction.

The urban schools described during the conference had a clear focus and a sense of direction. Dr. Robert Alioto, Superintendent of San Francisco Public Schools and Ms. Shirley Thornton, Principal of Balboa High School in San Francisco, for example, discussed the development of the San Francisco Redesign Program, a five-year master plan for educational reform. Eight objectives of the program were clearly specified, including improving the physical environment, improving community relations, improving attendance, and, ultimately, improving academic performance. These objectives provided the focus; the Redesign Program provided the direction. In a similar vein, Dr. Ruth Love, Superintendent of Chicago Public Schools, discussed the initiation of clearly stated academic goals, a clearly defined curriculum, and anti-vandalism programs during her tenure as Superintendent in Oakland, California. As Superintendent of Chicago Public Schools, she is planning to replicate all of these focuses. Finally, Dr. John Crew, Superintendent of Baltimore Public Schools, made reference to the development of "grade level expectancies" for all students in the Baltimore Public Schools.

Once the focus and direction were clear to the superintendents, they were communicated to everyone concerned with improved educational quality. Parents, community leaders, principals, teachers, and students all were informed of district-wide expectations concerning curriculum,

instruction, appropriate student behavior, and student learning. Clear roles and responsibilities are the rule, not the exception, in these urban schools. As Dr. Alioto and Ms. Thornton contend, "communicating what is expected is an important part of any reform."

The urban schools described during the conference all used (and advocated using) a coordinated, integrated effort to achieve their stated goals and objectives. Such an effort is suggested by Dr. Crew, who states that educators in the Baltimore schools have "created a comprehensive approach to instructional improvement that has produced measurable results." Similarly, Dr. Alioto and Ms. Thornton concluded that "cooperative efforts have indeed been the foundation of the San Francisco Redesign Program." Finally, Dr. Love's emphasis on the importance of parental and community involvement and support demonstrated an awareness of the need for such a coordinated, integrated effort.

The urban schools described during the conference all used what can be termed "data-based" and "evidence-driven" action to improve learning. The term "data-based" implies that a systematic, comprehensive evaluation program is in place. The term "evidence-driven" implies that the evaluation data are used to make appropriate instructional, learning, grading, and promotion decisions. Dr. Love mentioned the adoption of a comprehensive evaluation system and the use of achievement-based (rather than age-based) promotion decisions at particular grade levels. She also mentioned the importance of monitoring, an interesting term that has come to be associated with "data-based" check-ups on program implementation with "evidence-driven" actions based on the results of these check-ups.

Dr. Crew started his presentation with a statement of the need for assessment and measurement. In his words, "if there are no measures of what one is doing, then one is vulnerable to any attack questioning one's success." Such a statement asserts the reasoning behind "data-based," "evidence-driven" approaches to school and instructional improvement.

Data-based, evidence-driven approaches require technology to sustain them. Dr. Suppes presented a brief history of the development of technology in American education. He concluded with several speculations on the future of technology. Quite clearly, computer technology makes the management of data-based, evidence-driven approaches considerably easier.

Although the use of the technology is quite different in Baltimore and San Francisco, Dr. Crew, Dr. Alioto, and Ms. Thornton noted the value of computer technology in their papers. In Baltimore, computers are providing scoring and reporting services. Computer records of student achievement are used to make decisions concerning remediation, promotion, and graduation. In many ways, then, computers in the Baltimore schools provide support services. In contrast to Baltimore, computers in San Francisco are providing an instructional function. Computer-assisted instruction is available to students in Balboa High School in San Francisco in the areas of mathematics, reading, English, careers, preparation for the GED examination, and computer programming. The different uses of computer technology in Baltimore and San Francisco underscore Dr. Suppes' point that it is the use of technology, not

technology per se, that poses the majority of the future problems for education.

The urban schools described during the conference held principals and teachers responsible for the provision of a high quality of instruction. In Oakland and in Chicago, teachers were continuously informed about changes in curriculum and instruction that took place. Staff development became a central activity in the schools. An Administrative Development Office was created for principals. Principals monitored instruction; area superintendents monitored principals and the operation of the schools. Incentives were provided to teachers, which included money, public recognition, and released-time.

Similar concerns for the provision of high quality instruction were expressed by Dr. Crew, Dr. Alioto, and Ms. Thornton. Dr. Crew emphasized the importance of a system-wide program of supervision that made the improvement of instruction its goal. Dr. Alioto and Ms. Thornton explicitly noted the benefits of computer-assisted instruction; benefits that include private, non-threatening instruction, greater opportunity for success, enhanced time-on-task, and immediate feedback; and individual benefits that are likely to result in an overall increase in the quality of instruction received by the students.

The urban schools described during the conference seem to have rediscovered such intangibles as commitment, charismatic leadership, and a clear knowledge of who is in charge. One of the problems with reading proceedings of any conference is that the reader misses out on the way

the information was presented by the speaker: the enthusiasm and commitment evidenced by the presentation style of all presenters.

One of Mr. Hechinger's comments sums up much of what was learned at this conference; therefore, it is appropriate to conclude the introduction to the Proceedings with that comment: "The discussions made it apparent that urban schools have begun to benefit from two new trends that at first glance seem to counteract each other. The first is greater reliance on academic standards enforced by more tightly organized systems, while the second is greater choice for parents and children of the kind of schools and educational methods that appeal to them. The two add up to greater uniformity in quality control and greater flexibility in the way quality is delivered."

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THE REFORM OF AN URBAN SCHOOL SYSTEM: THE SAN FRANCISCO REDESIGN PROGRAM

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I. Background Information

In 1975, Dr. Wilson Riles, the California Superintendent of Public Instruction, condemned the San Francisco public schools as "an embarrassment to the State of California." This remark was confirmed in a lengthy article that appeared in the San Francisco Magazine about the condition of the San Francisco public schools in 1975:

> "...disorganized, in need of reform, and in deep trouble. Since then it has sustained major, crippling damage from several directions....
>
> Some of the district's problems--inflation, integration, and busing--have echoed the problems of much of the country. Others have cropped up elsewhere, but in the City take on an exaggerated form. In the City, enrollment has fallen almost 40% in 10 years. Reading scores were among the lowest in the State, despite a budget that spent more per pupil than almost any other district...."

The fiscal problem was further aggravated by the fact that inflation since 1975 has increased 53.2% while the general funding for the public schools had been increased by only 5% during the same seven-year period.

In addition, the San Francisco Grand Jury, in a report issued July, 1975, denounced the public school system and thereby rocked the educational

community. The Grand Jury criticized the schools in particular by citing mismanagement:

> "Over 80% of California's sixth grade students read at a higher level than those of San Francisco.... Learning does not thrive in turmoil, nor in an atmosphere of intimidation.... The Board violated common sense, the law, and the recommendation of Superintendent Morena when it adopted a deficit budget....
>
> The elected seven Board members are under great political pressure to go beyond the policy-making role for which they were chosen and involve themselves in the day-to-day operation of the schools. This creates chaos and undermines the effectiveness of the Superintendent of Schools. Many of the key subordinates have well-established pipelines to individual members of the Board, and use those pipelines effectively to further circumvent the Superintendent...."

In light of the above, it became necessary for Dr. Alioto, the newly appointed Superintendent, to develop a Redesign Program, the District's five-year master plan for educational reform in the San Francisco public schools. This program, approved in 1976, began to address the critical areas of instruction, personnel, school climate, budget, and community relations.

As an example of this Redesign Program, we have selected Balboa High School to serve as a prototype for the reform of public schools in San Francisco. Although the reform movement permeated the entire district, not all schools in San Francisco undertook the reform process in precisely the same manner, at the same speed, or with the same level of accomplishment. But at Balboa High School we can highlight special strengths and circumstances which made the situation exemplary, drawing from this experience techniques that can be duplicated elsewhere.

II. Statement of the Problem

Balboa High School was a large multi-ethnic inner-city high school beset with vandalism, violence, and racial tension. Students had a general lack of respect for the faculty; staff morale was low; and the administration was weak and ineffectual. Academic performance of students was in a state of deterioration. A poor attendance rate and a highly transient student population contributed to the decline of the school.

III. Objectives

Our objectives in reform were as follows:

1. To improve the physical environment
2. To decrease violence and vandalism
3. To reduce polarization of students in gang relationships
4. To reduce transiency and improve attendance
5. To improve academic performance/basic skills
6. To increase the number of graduates enrolling in higher education
7. To develop parental and community awareness and participation
8. To improve faculty morale and effectiveness

Ms. Shirley Thornton, a new principal, was assigned to Balboa High School in mid-August, 1980. Her first goal was to familiarize herself with Balboa High School. With the former principal, she toured the school and discussed the school's problems. She became acquainted with federal and state funded programs on site and studied reports and data on the school and its students. She also met with representatives of the community, faculty, staff, and students.

A. Specific Plans to Reach Objectives

After reviewing and evaluating the information she acquired, the principal decided to do the following:

1. Improve the physical plant before the beginning of school by replacing several hundred broken windows, painting over graffiti, and repairing broken lockers
2. Develop an effective way to report cutting and truancy to parents and to keep accurate records
3. Develop a plan for communication between administration and faculty
4. Develop written standard operating procedures for faculty and students
5. Review the school's curriculum and set instructional priorities, including assessing and restructuring remedial programs
6. Plan a structured staff development program
7. Improve faculty, staff, and student morale
8. Improve school-community relations and develop liaison with businesses, community colleges, universities, and other organizations

B. Reorganization of School

In addition, the principal began to reorganize the school by replacing some administrators, counselors, and department heads in order to move toward an ethnic representation that reflected the

student population. Following this, each department head met with the principal to review course offerings and department members. Faculty members were reassigned based on their strengths; for example, teachers were assigned to one department rather than three, and the number of class preparations for each teacher was reduced.

In the past, students were assigned to grade levels based on the number of years they were in school; the new method assigned students to grade levels based on the number of units they had successfully completed. Demoted students were counseled and placed in special homerooms and classes.

C. Development of Standard Operating Procedures

Communicating what is expected is an important part of any reform. Administration, faculty, and students all needed to be clear about their role and responsibilities in the school. To begin this process, the administration of the school met to discuss procedures that needed to be standardized and communicated to the rest of the school. A faculty handbook, student handbook, and counseling manual were developed with everyone's help. For example, the counseling manual was developed by a committee of counselors, teachers, parents, and students. The Vice Principal for Student Services conducted in-service training for all counselors; in turn, the counselors led in-service activities for the teachers.

D. Development of Attendance Plan

The school developed an attendance plan to help prevent student

failure caused by absence. Parents were notified by mail when their child missed three or more days of any class within a report period. The parent was asked to contact the teacher and to work together with the teacher on the problem.

E. Improvement of Basic Skills Through Computer-Assisted Instruction

The low achievement levels of students showed that instruction in the basic skills needed improvement. At another school, the principal had investigated and assessed various programs and technologies for remediating basic skills. As one component of the program, the principal had selected computer-assisted instruction (CAI)*. The effectiveness of the CAI program convinced the new principal to encourage the School Advisory Council to rewrite their Title I proposal to eliminate some superfluous staff positions and to add computer-assisted instruction. Parents, faculty members, and students from Balboa High School visited another local school that had the system for a number of years. The success of the program convinced the group to begin a program with 32 terminals. (Based on the initial success, another 64 terminals were added in spring, 1981, to bring the mini-computer system to its full capacity of 96 terminals.)

Formerly, the only remedial programs at Balboa High School were

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* CAI as used here refers to CCC-17 Instructional System from Computer Curriculum Corporation, 1070 Arastradero, Palo Alto, California 94304. This instructional system has many courses available in mathematics, reading, and language arts, ranging from the elementary level to the high school level.

"pull-outs" that served a small percentage of the low-skill students, disrupted classes, lacked integration with the content of the courses, and failed to serve limited English-speaking students. On the other hand, the CAI lab was designed to remedy these problems and to give a large number of students individualized work in such subjects as mathematics, reading, and language arts. Specifically, the courses used most frequently were Mathematics Strands, Reading for Comprehension, Fundamentals of English, Survival Skills, Exploring Careers, Introduction to Programming in CCC BASIC, and Critical Reading Skills.*

A CAI consultant provided in-service training for the staff on the use of the computer system and the content of the curriculum. Before the program began, the staff planned how they would use the CAI curriculum and diagnostic reports.

Recommended time per session in each course is 10 minutes per day. At Balboa High School most students enrolled in CAI took one math and one reading session a day for a total of 20 minutes. On alternate days, the students attended the CAI lab with a math class or an English class. Teachers brought whole classes into the lab and used the resources of the instructional system, such as the reports and printed worksheets, to integrate classwork and CAI work.

F. Characteristics of the CAI System

Computer technology combined with well-designed curriculum can deliver effective individualized instruction to large numbers of

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* See Attachment 1 for a complete list of courses available on the system.

students, keep accurate records, and provide the teacher with diagnostic information. We needed a system that would handle large numbers of students easily and be easy for the staff to manage, a system that reflected sound instructional design with specifically individualized lessons for each student.

More specifically, the system we selected has drill and practice courses in the basic skills and tutorial courses in more advanced subjects. The lessons are individualized and records are kept on student progress. In the basic skills courses, the subject is divided into "strands." A strand is a sequence of exercises in one skill area. For example, Mathematics Strands, Grades 1-6, is divided into fourteen strands, including vertical and horizontal addition, vertical and horizontal subtraction, equations, measurement, and so on. The individual student working in the course moves independently in each strand and builds an individual diagnostic profile which reflects the student's performance. This record of past performance is used by the program to tailor each lesson to the student's needs and is constantly updated.

With such a system, the teachers can request one of three kinds of printed reports on the student's progress:

a COURSE REPORT that shows the student's current level in each skill area and for the whole course

a GROUPING REPORT that identifies the particular skills in which the student's performance is lowest, so the teacher can group students with similar needs

a GAINS REPORT that shows individual and group progress since enrollment in the program*

This system also provides individually printed worksheets in mathematics and reading that serve to further integrate the CAI work with classwork. Teachers can request worksheets, generated by the computer and printed on the printer, in a single skill area or with a mixture of skills like a CAI lesson. The worksheets are individualized based on the student's daily progress. These worksheets are used for homework or classwork and also serve to inform parents about the work the student is doing.

Thus one can see CAI has many benefits for students, teachers, and administrators. Students work at their own pace, receiving private, non-threatening instruction. Students of varying levels of achievement can work side by side in the CAI lab, each with an equal chance of achieving success in the session and making gains because each is working at his or her own demonstrated level. Students can receive immediate feedback, see measurable progress, and receive a session summary at the end of every session. Student "time on task" can be enhanced. During a 10 minute session in mathematics, for example, a student may work from 30 to 50 exercises, be actively involved in practice of basic skills, and learn from the feedback given. The computer never gets angry or frustrated, never tires, and is ready to work 24 hours a day.

For teachers, CAI also provides benefits: the instructional

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* See Attachment 2

system is easily managed by automatically providing individualized instruction and by keeping current student diagnostic records; further, the teacher's other instructional efforts are complemented by CAI.

For administrators, the computer provides data that are useful for many needs: revising curriculum, counseling students, and assisting teachers in planning courses.

Obviously as indicated by the above, school reform can occur in many ways, but for the principal of Balboa High School the catalyst for change was CAI because it more than anything else can bridge the past, present, and the future. Therefore, in reporting results we will concentrate on CAI.

IV. Results of CAI Program

Earlier research on CAI by Computer Curriculum Corporation (CCC) has shown it to be an effective complement to any instructional program for most students. At the present time, 1,150 students are scheduled to take two courses each day for twenty minutes. We are emphasizing improving skills of ninth graders and have 45% of this group enrolled in computer sessions. In addition, 35% of the school's tenth grade students, and 10% each of the school's eleventh and twelfth grade students receive computer-assisted instruction.

Although we do not yet have complete data on student gains from Balboa High School, we do have data from the elementary and middle school level where the program has been in operation a number of years. In

particular, we looked at data from Bret Harte Elementary School, where CCC's CAI Program has been in operation for three years, and at Benjamin Franklin Middle School, where the program has been operating for four years. In fact, these data guided our decision to select this CAI system. These data also created certain expectations about student behavior and achievement.

Our research primarily focuses on student achievement gains, but we are also focusing on instructional and behavioral effects:

1. Correlation between level gains in the CAI curriculum and gains on the California Testing Basic Skills (CTBS). We expect to show a pattern of achievement similar to that documented in the CCC research literature. (See Poulsen and Macken, 1978.)
2. Correlation of participation in CAI and performance on district proficiency test, comparing past probabilities of success with current probabilities.
3. The effectiveness of CAI with different groups of students, focusing on the distribution of student scores in the various curriculums available.
4. The effect of CAI on classroom instructional rate, a descriptive analysis assessing whether teachers are able to cover more course material with CAI as a complement to instruction.
5. The impact of CAI on student behavior and attitude, including

effect on attendance, on concentration, on self-image, and on disruptive behavior in class and out of class.

Up to this point, we have discussed Balboa High School as a prototype of the reform movement, but we would be remiss if we did not briefly note some of the other factors in this reform movement.

Every year for the past six years the performance of students in the San Francisco schools, as measured by the California Achievement Program, has improved. An analysis completed by the San Francisco Chronicle, demonstrated that the San Francisco public schools have moved, in overall academic performance of California schools, from last place in 1975 to second only to San Diego in 1981. Thus, although academic gains were being made in some of the other large California cities, it was the San Francisco public schools that showed the greatest improvement.

During the past year, all four comprehensive San Francisco high schools which were up for evaluation (Galileo, Lincoln, George Washington, and Wilson) were granted the maximum accreditation by the Western Accreditation Association. This is in sharp contrast with the early 1970's when several of San Francisco's high schools suffered loss of accreditation and were given probation status.

In addition, in 1981, Money Magazine, based on a survey of university admission officers, designated Lowell High School as one of the top twelve high schools in the nation--the only one west of the Mississippi. And although Lowell High School has enjoyed a reputation for excellence for many years, it does not exist in a vacuum. Feeder schools, both

elementary and middle, for Lowell High School have been able--despite all of the cutbacks--to provide the basic academic instruction that undoubtedly helps students succeed at Lowell High School.

The administrative staff also developed strategies for in-depth analysis of individual schools where performance of students was not measuring up to District curriculum goals. Carefully selected teams with expertise in the area of reading have been working with those schools to improve the teacher/learning environment. The end result has been the dramatic improvement of student achievement in reading, as measured by the California Department of Education. Not only did these teams succeed in increasing student attendance at various sites but they also concentrated on improved academic performance.

For example, by completely revising the program, structure, and scheduling at Mission High School, such task force efforts have resulted in increased academic performance and in attendance. Attendance has been improved from an average of 60% to 93%. Similar efforts at Wilson High School, a school once racially out of balance and fraught with violence and vandalism, have transformed the school to one that is praised by parents, students, neighbors, and teachers. At both Wilson and Mission High Schools, the California Achievement test scores indicate that reading, writing, spelling, and math have improved. Similar task force efforts are underway at Galileo, George Washington, and Balboa High Schools.

In 1975, school achievement at the junior high level was also

disappointing. Benjamin Franklin Middle School, for instance, was considered in 1974-75 for closure because of incorrigible and violent student behavior. But by 1981, Benjamin Franklin Middle School was converted to an excellent middle school that is not only racially balanced but also one that competes in academic performance with other middle schools in the city. In addition, A. P. Giannini, Marina, Presidio, Roosevelt, and San Francisco Community Schools have improved to the point where they are competing academically with Aptos and Hoover Middle Schools, traditionally considered the best in San Francisco.

Another major aspect of the Redesign Program was the establishment of alternative schools and programs at all grade levels. With the implementation of the Redesign Program, fifteen alternative schools have been approved by the Board of Education and are now operational:

Elementary Schools
Douglas Elementary School
Bret Harte Elementary School
Lakeshore Elementary School
Lawton Elementary School
Claire Lilienthal Elementary School
John Swett Elementary School

Middle Schools
Lawton Middle School
Pelton Academic Middle School

High Schools
Alamo Park High School
Independent Study Center
Newcomer Center
School of Business & Commerce
Sunshine High School
Mark Twain High School
Raoul Wallenberg High School

In recognition of the continuing influx of limited and non-English speaking students, the bilingual education program has been improved and additional services have been developed to address special educational needs of these students. These services include the establishment of an intake center that assesses the student's proficiency and academic background, and addresses the question of proper grade placement. Newcomer programs have been developed with the conversion of Pacific Heights School into a newcomer center and with the placement of additional newcomer centers at Wilson, McAteer, and Balboa High Schools.

An attendance project was initiated that focuses on direct, personal contact with parents when students are illegally absent. This aggressive program, with a bilingual component, has been effective in obtaining parental cooperation and has resulted in an increase in attendance, including legal absences, on a district wide basis.

Furthermore, the district staff recently implemented Project Stay-At-School by utilizing the concept of counseling centers, as noted in the Redesign proposal. In cooperation with all city agencies, services are being provided to youths in a cooperative effort to improve student behavior, attendance, and performance. To support the program against violence in schools, the Board adopted a formal policy that requires exclusion of any student from school found to be carrying a dangerous weapon. As a result, disciplinary efforts by school principals have been actively supported by district staff.

The positive impact of these efforts was reflected in a study of

the California Department of Education that acknowledged San Francisco public schools as having the lowest rate of violent incidents among large school districts in the state, which is clearly a dramatic improvement over previous years.

The Redesign Program also reduced busing by over 50%, thereby effecting a savings of over $1.5 million. Not only did reduced busing lower expenditures, but it also improved the racial patterns at schools throughout the District. The following figures show the positive effect of reduced busing on racial balance:

School Year	Number of Schools over 50% Black	Black Students Attending Schools Over 50% Black	% of Total District Black Students Attending Schools Over 50% Black
1970-71	27	12,549	50.3%
1975-76	7	2,332	11.2%
1981-82	5	1,116	7.9%

Over the past six years, there has been a gradual but significant change in perception of the public schools by parents and the community. These perceptions are confirmed by many letters from parents making decisions to enroll their children in our public schools, and in many cases, from parents transferring their children from the private sector. For the past fifteen years, San Francisco student enrollment has been dropping at an annual rate of 3%. This year the total enrollment shows an increase of 2%, a turn-around of five percentage points in one year and a major accomplishment for an urban school district. Part of this unique shift is the result of inflation, but more importantly, we believe

the major portion of the increase in student enrollment is the result of this program to improve our public schools.

In addition to gaining the support of the parents and the community, the School District has gained the support of City Hall. Prior to 1975, the Mayor and members of the Board of Supervisors viewed the School District with open contempt and publicly took every opportunity to issue scathing statements regarding the competencies of the Board, the administration, and the teaching staff. Now they appear to support San Francisco public schools, and this has served to improve the morale of the entire school community. This attitude has also permeated all City agencies that deal with youth, encouraging a cooperative effort such as the following: the Fire Department's LEARN NOT TO BURN program in the schools, the Police Department's efforts to reduce truancy, the Social Services Department's involvement in the handicapped program, the Probation Department's efforts to curb delinquency, and the involvement of other agencies, too numerous to mention, have established positive working relationships with school officials that have resulted in better services to the City's children. Mayor Feinstein, in a recent letter to the Board acknowledged these cooperative efforts:

> "I wish to take this opportunity to express to you my great pleasure and pride in the successful establishment of PROJECT STAY-IN-SCHOOL in San Francisco. I consider this to be one of the most encouraging and important products of inter-department coordination that I have seen in San Francisco during my administration...."

In conclusion, we must also acknowledge that such cooperative efforts have indeed been the foundation of the San Francisco Redesign

Program. And with increased cooperative efforts, we hope we can make the San Francisco Redesign Program a model for other urban school systems that are struggling to resolve similar problems.

Attachment 1: CAI courses from Computer Curriculum Corporation available to students at Balboa High School

1. Mathematics Strands, Grades 1-6
2. Mathematics Strands, Grades 1-6, Spanish version
3. Problem Solving, Grades 3-6{{
4. Mathematics Strands, Grades 7 & 8
5. Mathematics Enrichment Modules, Grades 7 & 8
6. Introduction to Algebra
7. Adult Arithmetic Skills
8. Introduction to Programming with CCC BASIC
9. Reading, Grades 3-6
10. Reading for Comprehension, Grades 3-6
11. Critical Reading Skills
12. Adult Reading Skills
13. Language Arts Strands, Grades 3-6
14. Language Arts Topics
15. Fundamentals of English, grade 7 and above
16. Adult Language Skills I
17. Adult Language Skills II
18. Survival Skills
19. Exploring Careers
20. GED Curriculum
21. BASIC

Attachment 2: Reports

(If reports are going to be included, they should be reports of students who have taken several hours of coursework. These should be reports generated at Balboa High School)

I suggest including:

a Gains Report of a class of students in Reading for Comprehension

a Course Report of a single student in Mathematics Strands and
a Grouping Report of a class of students in Mathematics Strands.
Names of students can be blanked out leaving only initials.
Include with this report the explanation given below:

KEY TO HEADINGS ON REPORT FOR MATH 1-6

ID	The student's ID number
SES	Number of sessions the student has taken in this course, including sessions in fixed strands
TIME	Cumulative time spent working in this course
TO	Number of time-outs during the last session. A time-out occurs when a student does not complete an exercise within the set time limit.
LST	Number of exercises presented in last session
COR	Number of exercises answered correctly in the last session
NC-NG	Grade placement in each of the strands, to tenths of a grade year (30=3.0)

NC	Number Concepts	HM	Horizontal Multiplication
HA	Horizontal Addition	LW	Laws of Arithmetic
HS	Horizontal Subtraction	VM	Vertical Multiplication
VA	Vertical Addition	DV	Division
VS	Vertical Subtraction	FR	Fractions
EQ	Equations	DC	Decimals
MS	Measurement	NG	Negative Numbers

AVG	The student's weighted average grade placement to hundredths of a grade year (345=3.45)
+	The student signed on for a lesson on the day of the report.
*	The student stopped the last session ahead of time.
TP	The student has topped out of the strand.
--	The student has not yet received exercises from this strand.

HISTORICAL PERSPECTIVE ON EDUCATIONAL TECHNOLOGY

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As a comment on the paper by Dr. Alioto and Ms. Thornton, I would like to try to put the current efforts in educational technology in historical perspective. From this perspective I move to the present, with some remarks about the extensive efforts in San Francisco, and on to some predictions about the future.

Past Educational Technologies

I can identify at least five major technological innovations in the past that are comparable to the current computer revolution.

Written Records

The first is the introduction of written records for teaching purposes in ancient times. We do not know exactly when the use of written records for instructional purposes began but we do have, as early as Plato's Dialogues, written in the fifth century B.C., sophisticated objections to the use of written records.

Today no one would doubt the value of written material in education, but there were very strong and cogent objections to this very earliest innovation in education. The objections were these: a written record is very impersonal; it is very uniform; it does not adapt to the individual student; it does not establish rapport with the student. In other words,

Socrates and the ancient Sophists, the tutors of students in ancient Athens, objected to introducing written records and destroying the kind of personal relation between student and tutor that was a part of their main reason for being.

It has become a familiar story in our own time that a technological innovation has side effects that are not always uniformly beneficial. It is important to recognize that this is not a new aspect of innovation but has been with us from the beginning.

Libraries

The second innovation was the founding of libraries in the ancient world, the most important example being the famous Alexandrian Library that was established around 300 B.C. Because of certain democratic traditions, the preeminence of the creative work in philosophy and poetry, it is easy to think of Athens as the intellectual center of the Hellenic world. In fact, that center was really Alexandria. From about 250 B.C. to A.D. 400, not only was Alexandria the most important center of mathematics and astronomy in the ancient world--it was also a major center of literature, especially because of the collection in the Alexandrian Library. The first real beginnings of critical scholarship in the western world in literature, the editing of texts, the analysis of style, the drawing up of bibliographies, took place in the Alexandrian Library. This revolution in education consisted not simply of having in one place a large number of papyrus manuscripts but in the organization of large bodies of learning. Scholars from all over the western world

came to Alexandria to study and to talk to others.

Libraries of a substantial nature were to be found in other major cities of the ancient world, not to mention the large collections of learning in China, India, and Korea.

Printing

The third innovation of great historical importance in education was the move from written records to printed books. In the western world we identify the beginning date of this innovation with the printing of the Gutenberg Bible in 1452. It is important to recognize, however, that there was extensive use of block printing in Korea and China three or four hundred years earlier. Nearly half a millennium later it is difficult to have a vivid sense of how important the innovation of printing turned out to be. In the ancient world of the Mediterranean there were only a few major libraries, a number so small that they could be counted on the fingers of one hand. One of the famous aspects of Alexandria, for example, was the wealth and magnitude of its library, and the Alexandrian Library of 100 B.C. had few competitors. The reason is obvious: it was impossible to have large numbers of copies of manuscripts reproduced when all copying had to be done tediously by hand. The introduction of printing in the fifteenth century produced a radical innovation--indeed a revolution--in the distribution of intellectual and educational materials. By the middle of the sixteenth century not only European institutions but wealthy families as well had libraries of serious proportions.

Once again, however, there were definite technological side effects that were not uniformly beneficial. Those who know the art and the beauty of the medieval manuscripts that preceded the introduction of printing can appreciate that mass printing was regarded by some as a degradation of the state of reproduction.

It is also important to have a sense of how slow the impact of a technological innovation can sometimes be. It was not until the end of the eighteenth century that books were used extensively for teaching in schools. In arithmetic, for example, most teachers continued to use oral methods throughout the nineteenth century and it was not until almost the beginning of the present century that appropriate elementary textbooks in mathematics were available. It is certainly my hope that it will not require 500 years to distribute computers into schools, a figure comparable to what it took to distribute arithmetic textbooks into schools. Fortunately, the scale of dissemination in the modern world is of an entirely different order from what it was in the past. Perhaps my favorite example is the estimate that it took over five years for the news of Julius Caesar's assassination to reach the furthest corners of the Roman Empire. Today such an assassination would be known throughout the world in a matter of minutes.

With regard to the pace at which books have been introduced into education, it would be a mistake to think that there was something peculiar about the use of methods of recitation in the elementary school until late in the nineteenth century; stories of a comparable sort also

hold at the university level. According to at least one account, the last professor at the University of Cambridge in England who insisted on following the recitative tradition that dates back to the Middle Ages was C. D. Broad. As late as the 1940's he dictated and then repeated each sentence so that students would have adequate time to write each sentence exactly as dictated. I cannot imagine contemporary university students tolerating such methods.

Mass Schooling

The fourth innovation, and again one that we now accept as a complete and natural part of our society, is mass schooling. We have a tendency in talking about our society to put schools and families into the same category of major institutions. But it is extremely important to recognize the great psychological difference between the status of the family and the status of schools. Families are really deep into our blood and our culture. The evidence of families in one form or another being the most important cultural unit goes back thousands of years. Schools are not at all comparable; they are, we might say, very much Johnny-come-lately to our culture. A hundred years ago in 1870, for example, only two percent of young people graduated from high school in the United States. A hundred years before that only a very small percentage even finished third or fourth grade. I cannot give you an exact percentage because our record-keeping, that is, our social statistics, are not much more than a hundred years old and we have no serious idea of how many students were actually in school

two hundred years ago, except that we do know that the number was quite small.

Even as short a period as fifty years ago, in most of the world less than one percent of the population completed secondary school. During the recent upheavals connected with the "cultural revolution" in China the elementary schools, not to speak of colleges and secondary schools, were closed for several years. In our society as we now think of it, it is unbelievable to contemplate closing the elementary schools for such a period of time. From a Chinese historical perspective, however, it was not such an important matter, for Chinese culture extends back continuously several thousand years and there is in that cultural tradition no salient place for mass schooling.

In many developing countries of the world today the best that can be hoped is that the majority of the young people will be given four grades of elementary school. Until the population growth is brought in check, it will take all available resources to achieve this much. The position of America as a world leader in education is sometimes not adequately recognized by my fellow Americans, because we accept as so much a part of our culture the concept of all young people completing secondary school and a high percentage going on to college. In fact, our leadership in creating a society with mass education is perhaps one of the most important aspects of American influence in the world.

As recently as the latter part of the nineteenth century the British philosopher, John Stuart Mill, despaired of democracy ever really working anywhere in the world for one reason--it was simply not

possible to educate the majority of the population. In his view it was not possible to have a significant percentage of the population able to read and to be informed about political events. As in the case of many such predictions, he was very much in error. The revolution in mass schooling is one of the most striking phenomena of the twentieth century.

Testing

The fifth educational innovation is testing, which is in many ways older than the concept of mass schooling. The great tradition of testing was first established in China; testing there began in the fifth century A.D. and became firmly entrenched by the twelfth century A.D. There is a continuous history from the twelfth century to the end of the nineteenth century in the use of tests for the selection of mandarins--the civil servants who ran the imperial government of China. The civil service positions held by mandarins were regarded as the elite social positions in the society.

The importance of these tests in Chinese society is well attested to by the literature of various periods. If one examines, for example, the literature of the fifteenth or sixteenth century, one is impressed by the concern expressed for performance on tests. A variety of literary tales focused on the question of whether sons would successfully complete the tests and what this would mean for the family. (As you might expect, in those days women had no place in the management of the society and no place as applicants for civil service positions.) The procedures of selection were as rigorous as those found in a contemporary medical

school or a graduate school of business in the United States. In many periods fewer than two percent of those who began the tests (which were arranged in a complicated hierarchy) successfully completed the sequence and were put on the list of eligible mandarins.

Although testing has a history that goes back hundreds of years, in many ways it is proper to regard testing as a twentieth-century innovation because it was only in this century that the scientific and technical study of tests began. It is only in this century that there has been a serious effort to understand and to define what constitutes a good test for a given aptitude, a given achievement, or a given skill. Moreover, this intensive study of testing from a technical standpoint was primarily a focus of American research by such educational psychologists as Edward L. Thorndike. The tradition that Thorndike began has become a major one in our society and is a source of continual controversy in terms of issues of fairness and objectivity. Certainly current speculations as to the reasons for the decline in the verbal and mathematical scores on the Scholastic Aptitude Tests provide an excellent example of the kind of detailed scrutiny we give our tests that is completely uncharacteristic of any tradition of testing, whether in China, Europe or the United States prior to this century.

The five innovations that I have discussed--written records, libraries, printed books, schools, and tests--are the very fabric of our educational system today. It is almost unthinkable to contemplate a modern educational system without each of these innovations playing an important part.

Of these five technologies, none had been in any way adequately forecast or outlined at the time it was introduced. Of course, a few individuals foresaw the consequences and had something to say about those consequences, but certainly the details of the use of any of these five technologies had not been adequately foreseen. I am certain that the same thing will be true of technologies now developing for use in the future, and so I do not want to appear confident that what I say is a correct scenario for the future. But I want to say something about each of the five. First, I have mentioned, and I want to re-emphasize, the very recent and historically very transient character of schools. It is a phenomenon in a general sense of the last hundred years in the most developed parts of the world, and a phenomenon of the last thirty years or so (that is, since World War II) in the underdeveloped parts of the world. Now, an important question for the future is this: In fifty or one hundred years, will we abolish schools? Will we deliver into the home, or into small neighborhood units, by technological means all curriculum and instruction? Further, will the desires or goals of the individual, the family, the parents, or the neighborhood group be such that children will not be in school, but at home or in the neighborhood? The answers to these questions are not easy to predict or to foresee.

The same kind of forecast may be made for books. The importance of books that we have felt for several hundred years, since the beginning of the Renaissance, and that has been associated with the development and education of an informed citizenry, may fade away. I

think that all of us, at least those of my age, have seen this already in the case of young students. Some recent studies have indicated that the cultural reference points of the younger generation are no longer to be found in books, or in current novels, but in television and movies.

In the case of tests, I also predict that this classical technology will decrease in importance. I believe that tests will decrease in importance because we will have the technological means to keep a much more satisfactory and much more detailed record of the learning of individual students. Thus inferences about the performance of students and their capabilities for taking next steps will depend upon a much more substantial record, a much better basis of inference than we have in current tests.

As for libraries, they will be totally transformed. I feel more confident of this prediction than of any of the others. Electronic access will be widely available in homes, in offices, and in schools of what other organizational kind we have. There will be libraries but they will be electronic libraries.

Finally, what about the written record? The written record will undoubtedly continue to have importance, but I think that when it comes to teaching, the objections found in Plato's Dialogues to the cold and neutral written word as opposed to the warm and friendly voice of the teacher will once again be heard and perceived as serious objections. What I am saying is that, in starting to think about the future, we can forecast obsolescence or semi-obsolescence for all of the great technologies of the past--and that is proper and appropriate.

Issues Raised by Computer-Assisted Instruction

The current operational use of computer-assisted instruction in many schools in this country, a use that is well exemplified by the detailed discussion of Alioto and Thornton, raises a number of issues of a broad educational and social kind to which I would now like to turn. I will discuss four rather closely related issues that have had a certain prominence in the discussion of computer-assisted instruction (CAI): 1) individualization of instruction, 2) standardization of instruction, 3) complexity of instruction, and 4) freedom in education.

Individualization of Instruction

The first issue centers around the claim that the deep use of technology, specifically computer technology, will impose a rigid regime of impersonalized teaching. Perhaps the best image of this issue in the popular press is that of student protest at being represented by computer records in the files of the central school administration.

To those advancing this claim of deep impersonalization, it is important to say that indeed this is a possibility. Computer technology could be used in this way, and in some instances it probably will. This is little different from saying that there are many kinds of teaching and many ways in which the environment of learning and teaching may be debased. The important point to insist upon, however, is that it is certainly not a necessary aspect of the use of the technology.

Indeed, our claim would be that one of the computer's most important potentials is exactly the opposite. Computers can make

learning and teaching more personalized rather than less so. Students will be subject to less regimentation and lockstepping, because computer systems will be able to offer highly individualized instruction.

It is important that the remark about individualized instruction not be passed off as sloganeering. For many years, courses in the methodology of teaching have emphasized the importance of teaching according to the needs of individual students and therefore attempting to individualize instruction as much as possible. It is recognized, however, by anyone who has examined the structure of our schools either at the elementary- or secondary-school level that a high degree of individualization is extraordinarily difficult to achieve when the ratio of students to teachers is approximately 25 to 1.

One direct approach is to reduce this ratio to something like 5 or 10 to 1, but the economics of this approach is totally unfeasible in the long run and on a widespread basis. All the evidence points to the fact that the cost of having first-rate teachers in the classroom, training these teachers appropriately, and providing them with the kind of salaries that will be competitive with other technical and professional jobs in our society will simply make it impossible for schools to afford any drastic reduction in the student-teacher ratio. One of the few real opportunities for offering individualized instruction lies in the use of computers as instructional devices.

I do wish to emphasize that I do not envisage replacing teachers entirely, especially at the elementary-school level. It would be my estimate that even under the maximum use of technology only 20 to

30 percent of students' time in the elementary school would be spent at computer terminals. While classes or substantial parts of classes were working at terminals, teachers would be able to work with the remainder. Moreover, they would be able to work intensely with individual students, partly because some of the students would be at the terminals, and equally because routine aspects of teaching would be handled by the computer system.

At the post secondary level, matters are very different. At most colleges and universities, students do not now receive a great deal of individual attention from instructors. Certainly we can all recognize the degree of personal attention is greater in a computer program designed to accommodate itself to individual students' progress than in the lecture course on a general subject that has more than 200 students in daily attendance.

Complex intellectual problems are yet to be solved in offering tutorial computer programs on advanced subjects at the university level. I do believe that the teaching of basic skills ranging from elementary mathematics to foreign-language instruction at the college level can well be performed by computer-assisted courses. Extensive results of many efforts in computer-assisted instruction at the university level at Stanford are reported in Suppes (1981).

Standardization of Instruction

A second common claim is that the widespread use of computer technology will lead to excessive standardization of education. This

claim was raised repeatedly in general discussions with educators and the interested public. In 1968 when I was lecturing on computer-assisted instruction in Australia, exactly this claim was made by one of the senior professors of education in Australia. When he was asked how many different books on Australian history are used in the Australian secondary schools, the reply was that two books are used in over 90 percent of the classes.

To those familiar with current practices in textbook adoption and use in elementary and secondary schools, it is clear that a high degree of standardization already exists in education. It is important to admit at once that a still greater degree of standardization could arise from the widespread use of computers. This is a possibility not to be denied. It is, however, in no sense a necessity. It would technically be possible for a state department of education, for example, to require that at 10:10 in the morning every fourth-grader be adding one-half and one-third, or every junior high school be reciting the amendments to the Constitution. The central danger of the technology is that edicts can be enforced as well as issued, and many persons are rightly concerned at the spector of rigid standardization that could be imposed.

I think we would all agree that the ever-increasing use of books from the sixteenth century to the present has deepened the varieties of educational and intellectual experience generally available. It is not difficult, however, to construct a caricature of present concerns in terms of the horrors it might have been claimed would be introduced with

the widespread use of books. It is easy to visualize a certain type of critic arguing that the highly individualized and effective qualities of the individual teacher's voice could be lost in the completely standardized use of the written word and the written text. The individualization of comment, the adaptation of comment to the expression of individual students and to their responsiveness and comprehension, would be lost in the use of books in place of teachers.

Now we all recognize that there is a truth at the heart of this caricature, but it is not a truth that argues for the abolition or suppression of books in education. It argues rather for a wide variety of educational experiences.

There is every reason to believe that the appropriate development of CAI programs will enable us to take a highly significant step beyond the introduction of books and to offer unparalleled variety and depth of curriculum to students of all ages. Indeed, the problem in avoiding standardization is not the limitations of the technology, but our ignorance of how to diversify approaches to learning in meaningful and significant ways.

The basic scientific data on these matters are pitifully small. Opinions can be found in every educational group, but they are opinions. Moreover, from an operational standpoint it is not possible to find any wide diversity of approaches to most of the standard subjects in the curriculum. Do we want an auditory approach to the learning of language for one student and a visual approach for another? Do we want a politically oriented presentation of American history for some students

and a socially oriented presentation for others? Do we think that different cognitive styles can be identified in a sufficiently deep way to justify and guide the preparation of vastly different curricula in the same general subject matter?

These questions are not in any way bound to computer technology. These are fundamental questions about the science of curriculum, the art of teaching, and the philosophy of education that reach out to very general questions of social policy. The computer is there to be used in whatever way we choose. Uniform standardization of the curriculum will be the end product only if we are so lacking in imagination as to achieve nothing else.

Complexity of Instruction

The third claim often heard is that the limitations of the technology and the problems that must be overcome in using it will lead to the development of curricula that will almost necessarily be simpleminded in character. There are indeed some unfortunate historical examples in the literature of curriulum efforts, especially curriculum efforts in a technological setting.

In the early days of programmed instruction, for example, a number of texts on elementary mathematics were written by psychologists or educators who did not have adequate training in mathematics. The programmed texts were splattered with "howlers" that received the eager attention of the mathematics educators charged with reviewing the books. Similar kinds of blunders can occur in the case

of computer-assisted instruction, but there is nothing special about computers, and it is hard to see that a serious argument can be made to claim that there is any reason why computer-assisted instruction will be worse than other forms of curriculum.

The world is full of textbooks that are obviously bad in many respects. Within mathematics, for example, there are elementary books that are full of mathematical mistakes; there are also elementary books that are mathematically correct, but pedagogically bad beyond belief. No doubt programs exhibiting these two extremes will also be written for computer-assisted instruction in mathematics.

There are reasons, however, for thinking the situation will be more self-corrective in the case of CAI than in the case of ordinary textbook writing. One reason is simply that data can be gathered and authors can be presented in tough-minded fashion with a clear picture of the defects of the materials they have written. For example, in a program in elementary mathematics if a particular sequence of concepts or problems is missed by a high percentage of the students encountering it, the transmission of this information to those who wrote the program is an obvious signal that changes are needed.

Surprising as it may seem, authors of textbooks in elementary mathematics seldom receive such information. They get many good and penetrating criticisms from teachers and other persons concerned with curriculum, but they seldom get hard behavioral data on individual parts of the text. Similarly, the evaluation that compares a given new text with a standard old text by looking at the achievement data for

experimental and control groups is almost always far too coarse an evaluation to provide any focus for revising the particular features of the new text. On the other hand, the problems of gathering detailed data about an ordinary textbook are too onerous to be feasible in most cases.

Freedom in Education

The fourth and final issue I wish to discuss is the place of individuality and human freedom in a modern technological society. The crudest form of opposition to widespread use of technology in education and in other parts of society is to claim that we face the real danger of men becoming slaves to machines. This argument is ordinarily made in a romantic and naive fashion by those who seem themselves to have little understanding of science or technology and how it is used in our society. The blatant naiveté of some of these objections is well illustrated by the story of the man who was objecting to all forms of technology in our society and then interrupted his diatribe to say that he has to rush off to telephone about an appointment with his dentist.

No scientifically informed person seriously believes that our society could survive in anything like its present form without the widespread use of technology. It is our problem to understand how to use the technology and to benefit wisely from that use. Indeed, the claim about slavery is just the opposite of the true situation. It is only in this century that widespread use of slavery has been abolished, and it may be claimed by historians of the distant future that mankind

could not do without slavery, because just as human slaves are being abolished, within a short time span they will be replaced by machine slaves whose use will not violate our ethical principles and moral sensibilities.

One can indeed imagine a historical text of 2500 or 3000 A.D. asserting that for a short period in the latter part of the twentieth century there was little slavery present on earth, but then it was discovered that machines could be made that could do all the work of human slaves, and so in the twenty-first century the luxury of slaves and the personal service they afforded was brought not to the privileged few as had historically been the case before the twentieth century, but as a standard convenience and luxury for all people on earth.

In our judgment, the threat to human individuality and freedom does not come from technology, but from another source that was well described by John Stuart Mill in his famous essay On Liberty. He said,

> The greatest difficulty to be encountered does not lie in the appreciation of means toward an acknowledged end, but in the indifference of persons in general to the end itself. If it were felt that the free development of individuality is one of the leading essentials of well-being; that it is not only a co-ordinate element with all that is designated by the terms civilization, instruction, education, culture, but is itself a necessary part and condition of all those things; there would be no danger that liberty should be undervalued, and the adjustment of the boundaries between it and social control would present no extraordinary difficulty.

Just as books freed serious students from the tyranny of overly simple methods of oral recitation, so computers can free students from

the drudgery of doing exactly similar tasks unadjusted and untailored to their individual needs. As in the case of other parts of our society, our new and wondrous technology is there for beneficial use. It is our problem to learn how to use it well.

When a child of six begins to learn in school under the direction of a teacher, he hardly has a concept of a free intelligence able to reach objective knowledge of the world. He depends heavily upon every word and gesture of the teacher to guide his own reactions and responses. This intellectual weaning of children is a complicated process that we do not yet manage or understand very well. There are too many adults among us who are not able to express their own feelings or to reach their own independent judgments. We would claim that the wise use of technology and science, particularly in education, presents a major opportunity and challenge. We do not want to claim that we now know very much about how to realize the full potential of human beings; but we do not doubt that our modern instruments can be used to reduce the personal tyranny of one individual over another, and increase individual freedom.

Intellectual Problems of the Future

Computers That Talk

Let me break this discussion of future intellectual problems into four parts that will take us back through some of the earlier technologies. The first problem is simply that of talking (oral speech). What does it take to get a computer to talk? The fact is that the technical issues

are already pretty well in hand. Perhaps the reader has seen on television "The Forbin Project"--a movie about two large computers in the Soviet Union and the United States getting together to dominate the world. To those who have seen that movie, let me make a casual remark about talking. A technical criticism of the movie is that the two very large and sophisticated computers were conducting only one conversation at a time. Already in our computer system at Stanford, we have eighteen channels of independent simultaneous talk and the computer talks independently and differently to eighteen students at the same time. So you see, we have the capacity for the computer to talk. What we need, however, is better information about what is to be said. For example, when I serve as a tutor, teaching one of you, or even when one of you is teaching me, intuitively and naturally we follow cues and say things to each other without having an explicit theory of how we say what we say. We speak as part of our humanness, instinctively, on the basis of our past experience. But to satisfactorily talk with a computer, we need an explicit theory of talking.

Computers That Listen

The replacement of the written record, the kind of record that was objected to in Plato's Phaedrus, can be available to us in the talking computer. The other side of that coin which Socrates also emphasized, or should have emphasized, concerns listening. It is a much more difficult technical problem. The problem of designing a computer that can listen to a student talk is much harder than having

a student listen to the computer talk. However, the problem is solvable.

The Use of Knowledge

To have an effective computer-based system of instruction, we must transcend mindless talking and listening and learn to understand and use a large knowledge base. For example, if we were simply to require information retrieval from a knowledge base, it would be relatively simple in the near future to put the entire American Library of Congress in every elementary school. The capacity to store information is increasing so rapidly that we will be able to store much more information than could ever possibly be used.

A different and more difficult question is how to get the student to interact with the sizable knowledge base. As we come to understand how to handle such a knowledge base, the school computer of the future should be able to answer any wayward question that the student might like to ask. Moreover, as we all know, once a student uses such a capability, he will have a strong tendency to pursue still further questions that are more difficult and more idiosyncratic. It will, I think, be wonderful to see how children interact with such a system; in all likelihood, we will see children give to learning the high degree of concentration and the sustained span of attention they now give to commercial television.

There is one related point I want to emphasize. From the very beginning of school, students learn quickly the "law of the land" and

know they should not ask questions the teacher cannot answer. This task of diagnosing the limitations of teachers begins early and continues through college and graduate school. So, once we have the capacity for answering out-of-the-way questions, it will be marvelous to see how students will take advantage of the opportunity and test their own capacities with a relentlessness they dare not exhibit now.

Need for Theories of Learning and Instruction

The fourth problem, and in many ways the least-developed feature of this technology, is the development of an adequate theory of learning and instruction. We can make the computer talk, listen, and adequately handle a large knowledge data base, but we still need to develop an explicit theory of learning and instruction. In teaching a student, young or old, a given subject matter or a given skill, a computer-based learning system can keep a record of everything the student does. Such a system can gather an enormous amount of information about the student. The problem is how to use this information wisely, skillfully, and efficiently to teach the student. This is something that the very best human tutor does well, even though he does not understand at all how he does it, just as he does not understand how he talks. None of us understands how we talk and none of us understands how we intuitively interact with someone we are teaching on a one-to-one basis. Still, even though our past and present theories of instruction have not cut very deep, it does not mean that we have not made some progress. First, we at least recognize that

there is a scientific problem; that alone is progress. One hundred fifty years ago there was no explicit recognition that there was even a problem. There is not stated in the education literature of 150 years ago any view that it is important to understand in detail the process of learning on the part of the student. Only in the twentieth century do we find any systematic data or any systematic theoretical ideas about the data. What precedes this period is romance and fantasy unsubstantiated by any sophisticated relation to evidence. So at least we can say that we have begun the task.

Alternative Educational Structures

Let me give some examples of changes we can effect in the structure of educational institutions by using appropriately the new technology of computers and television. Because of my own special interest in computers, I shall concentrate on computer possibilities; but it should be understaood that television would also be a component for the proposed changes in structure.

High Schools

My first example concerns the organization of high schools. An American phenomenon, much discussed in the history of education in the twentieth century, has been the introduction of the consolidated high school that brings together students from small schools to a centrally located large school that offers a variety of educational opportunities and resources to the students. The American consolidated high schools is one of the glories of the history of education. Today, however, many

of us feel that the large high school has become one of the most difficult institutions to deal with from a social standpoint. The mass aggregation of adolescents in one spot creates an environment that is on the one hand impersonal, and on the other potentially explosive, partly because of the large numbers of students and supervising adults in close quarters.

The use of our new technology will make possible an alternative structure that will return us to the small schools of the past. The ideal high school of the future may consist of no more than a hundred students and, in many cases, be located close to students' homes; it may be a specialized school, catering to students' particular interests. The variety of curriculum and other educational resources, such as libraries, that has been so important a feature of the consolidated high school, will be made available by computer and television technology. I should say in this connection that the changes that can be brought about through the use of computers are more drastic and more radical than those that can be effected only through television. The difference is the possibility of a high level of interaction between the computer program and the student, the sort of thing that is not possible with a standard television lecture or laboratory demonstration.

Elementary Schools

My second example concerns alternatives to elementary schools. Through most of the history of civilization, young children have been

taught primarily at home, often perhaps in an extended family group. We now have the technical possibility of returning the student to the home or to a small neighborhood group. Although these alternatives have not yet been thoroughly explored, it is important that discussion of their availability begin as early as possible. As far as I know, the new romantics in education have not discussed the radical possibility of dissolving elementary schools entirely and returning the child to the home--or to a neighborhood group of three or four homes--for his education.

In describing this possibility, let me emphasize that I am not maintaining that it is necessarily a wise move. I do, however, think it important that this technical possibility is now available. At the very least, it should be explored experimentally. By proper use of computer technology, the basic skills of reading, mathematics, and language arts can easily be brought to the student in the home or in a cluster of homes. Most of the elementary science curriculum also can be handled by computer. Other parts of the elementary science curriculum, of the social studies program, and much of the work in art and music could be handled by television. I envisage a situation in which a master teacher would divide his time among several units. The mothers of the children would assume responsibilities for supervision and some would work as teachers' aides. Such an approach would be completely natural, because of the proximity of the school to their homes. In many urban settings, for example, it would be natural to place classrooms in apartment complexes. In other districts,

a small one-room building could be added, or it might even be feasible to pay a small rent to one of the families for the use of space in a home. The main thing to avoid is heavy capital expenditure for physical plants; we have had too much of this in the past.

Higher Education

The third alternative structure deals with higher education. Here the possibilities are perhaps the easiest to implement and may be realized sooner than the others. In the areas surrounding Stanford, several community colleges are already offering courses for credit by television. As we face the costs throughout the world of providing higher education for increasing numbers, the use of computers and television to reduce costs and to decentralize the educational effort seems almost inevitable. One can see terminals available in apartment complexes for students at the community-college level. At a later stage, one can envisage terminals in plants where employees work full-time, but also actively pursue their education. I should mention that in California, for example, a reasonable percentage of students in the state higher educational system are employed full-time, simultaneously with their enrollment as students. The development of such a delivery system for higher education will also naturally answer demands for continuing education for adults. At a more distant date, one can expect the terminal resources described earlier to be available in the home for the teaching of a wide range of subjects, from foreign languages to advanced technical courses in science and mathematics.

I emphasize, however, that the problems of institutional change of the sort just discussed are poorly understood. There is evidence that universities, for example, are among the most conservative institutions in our society. In any case, the rapid development of alternative structures for education will be neither simple nor easy. On the other hand, the willingness of community colleges, which do not have a long tradition, to consider new methods of instruction and new approaches is encouraging. There are problems of prejudice and entrenchment, but there are also intellectual problems of understanding the kinds of organization we want for the future. The technology affords many possibilities, but we have not thought through which of these possibilities we consider the most advantageous, the most interesting, or the most exciting.

The central idea I have been stressing is that through computers we have the means to develop alternative structures that will effectively decentralize the present educational system. The issue of decentralization of services, of places of work, of almost all aspects of our life is gradually coming to the fore as a central social and political problem of the last part of the twentieth century. The issues involved in decentralizing education will be among the most significant of these problems of decentralization. The problems that face us are not really technological: they are conceptual, institutional, and social. I have certainly not made any concrete suggestions for tackling these problems; at most, I have tried to bring them to your attention.

IMPROVING BASIC SKILLS: FACTORS TO CONSIDER

Ruth B. Love
Superintendent
Chicago Public Schools

Public education today faces numerous crises: a crisis in confidence in which people have lost faith in the public school's ability to educate its students; a crisis in performance in which students from public schools are graduating without basic or marketable skills necessary to pursue further education or a job; and a crisis in the concept of democracy in which officials are willing to write-off a sizeable portion of the student population as being uneducable and unentitled to educational opportunities.

All of these crises pose serious threats to public education, but the latter crisis stands to undermine our efforts to address the crisis in confidence and the crisis in student performance. Indeed the clear signals and efforts to create an elitist system of education shake the very foundation of public education and its herculean responsibility to provide education as a vehicle for upward mobility. Public education is an inclusive rather than an exclusive institution. If public education gives way or falls by the wayside, many children will not receive the educational opportunity this nation espouses and practices.

Questions must be raised: Why do we have a crisis in confidence? Where have we failed and how have we succeeded? What has worked? How

can we move forward? Answers to these questions may be found if one examines factors that must be considered if we are to improve basic skills. More specifically, I would like to discuss community, school, and instructional factors.

COMMUNITY FACTORS

Parent Information and Involvement

Without a doubt, parental participation is a critical variable in improving basic skills. One avoids it at one's own peril. In Oakland, where I have served as superintendent, and currently in Chicago, where I am beginning to replicate successful practices from Oakland, I have encouraged parents to become knowledgeable about and involved in the education enterprise. The orderly dissemination of information to parents regarding learning standards have been summarized and shared with parents. All parents have received copies of standards for the grades in which their children were placed. This information has provided a kind of map for parents to use in tracking their children's progress and problems. Further, it has signaled areas where parents might reinforce learning and help at home. The enthusiasm generated has given the entire program momentum. In the past, parents were frequently inquiring about the status of their youngsters or about specific objectives or standards. Now their questions are answered by this periodic data which serves as an informal report card.

SCHOOL FACTORS

Academic Goals and Standards

In Oakland and now in Chicago, I have had to also consider certain school factors that contribute to improving basic skills. More specifically, in Oakland we set three new academic goals:

1. Children who complete the third grade will be able to perform certain basic skills.
2. Starting in the second grade, a program of intervention will be provided for children who are falling one year behind grade level expectations in basic skills.
3. Graduating students will possess the necessary academic resources for college or employment.

In deciding how to meet these goals, we arrived at the following conclusions: the organizational structure simply did not correspond to the determination to make instructional improvement the number one priority; years of "survival budgets" had withered away curriculum support positions; moreover, such instructional personnel available were mainly from special state and federal projects; we found ourselves in the position of having a lot of icing and almost no cake.

Drawing upon the interest of citizens and the expertise of staff, we established completion standards for each grade level for every subject. Beginning with reading and mathematics, technical task teams of teachers, administrators, and specialists developed sets of standards for citywide use. The purpose was simply to establish uniform standards for academic performance. Each technical task team focused on a

particular subject and reviewed the literature as well as ongoing practices inside and outside the school system. Funded from private sources, some 300 teachers were released three days a week to engage in this formidable, but exciting process.

As task team's reports and guides were completed, the Instructional Strategy Council (ISC) received an in-depth presentation, posed hard questions, and ultimately approved the document. Once approval of the superintendent was obtained, the Oakland School Board approved it, thereby making the standards and the guides Board Policy.

Because each school was represented on the Technical Task Team (TTT), each developed an ownership of the materials. Great care was exercised to stipulate standards and curriculum content but not teaching techniques. The point was to insure that every teacher and principal became conversant with the expectations Oakland had for its students, regardless of where they lived, their color, or economic background. The way individual teachers reached the standards was a professional matter related to technique, personality, and style. Standards prepared in quantifiable terms for each grade level set forth the basic framework for improvement. Within two and one-half years, 15 subjects or courses in all grades were in final form. This meant that a solid foundation was in place.

The challenge at this point was to convince staff that these standards could be reached. For underachieving students, the expectations remained constant while techniques for reaching those standards differed. For example, most students whose academic performance was below par received supplemental state or federal program services.

Staff Development

Once the learning standards and guides were in large binders to make them easily useable in the classroom, the challenge was then credible implementation. To this end, orientation sessions were held to achieve two goals.

The first goal was to provide information relative to standards, curriculum, and evaluation. Teachers were expected to become thoroughly familiar with the program, and schools were asked to decide upon books to use in meeting completion standards.

The second goal was to inspire teachers and principals to join in the effort. Incentives took various forms: identifying master teachers and offering them remuneration to work (after school) with specific teachers who were also paid; designating specialty schools, which was an attempt to recognize and reward success and achievement. Each specialty school was provided funds to serve as a demonstration and training center. Teachers in satellite schools were provided released time to observe in the specialty schools and to attend follow-up workshops; increasing and organizing trained volunteers, to help teachers in the classroom, served as a necessary stimuli; and holding periodic subject meetings with the superintendent was used to give recognition so that teachers would not merely perform, but want to perform.

Here again, staff development was tailored to meet the needs of a variety of staff. The orientation sessions were quickly followed

by on-site, regional, and citywide meetings. Most sessions involved workshops designed to offer practical ideas and suggestions.

Because we believe that the pivotal person in making an effective school is the principal, an Administrative Development Office was created and individual and group programs were provided for principals. Each year, prior to the opening of school, an academy for managers provided planning time for principals and selected teachers so they could address issues and formulate their plan of action for the year.

Effective Schools Criteria

All employees were made aware of the following six basic characteristics of an effective school:

The first characteristic is leadership, specifically the principal, who is the instructional leader, a good manager of people, materials, time, and resources, as well as the spokesman of the school.

The second characteristic is a set of specific objectives, reflecting time limits and measurement standards. The personnel in an effective school must know exactly what is expected by when. Results must be observable or objectively measurable, and intermediate steps must be defined as an aid to determining progress or the lack of progress.

The third characteristic is a clearly defined curriculum, easily understood and easily implemented. Although the curriculum is the basic plan for education, it must also be flexible enough to allow for instructional approaches that are well understood by teachers.

The fourth characteristic is comprehensive evaluation that permits one to find out how to improve programs. Results of tests generally reveal specific things: low scores indicate the need for a careful look at the program with an eye to improving it; high scores may give a clue to areas of strength that can be applied elsewhere. Again, it comes back to the principal and the leadership team in the school, who must scrutinize the test results and determine how to improve instruction.

The fifth characteristic is competent and dedicated teachers. The central relationship of the school system is that between the teacher and the students, and the primary transaction is the inculcation of learning in children by the teacher. Principals, custodians, lunchrooms, district offices, central offices, boards, committees, authorities, and even general superintendents of schools, exist only to sustain, enhance, and reinforce that relationship. If no school can be better than its principal, it is also true that no classroom can be better than its teacher.

The final characteristic is parental involvement. Children spend only about 12 percent of their time during a year in school. The rest of the time is spent largely with their families and friends; therefore, education must be continued in the home. This is often done through homework, which parents can strongly support and encourage. But it can also be done by involving parents more actively in their children's education in the school. Parents have many talents that can be useful in school. Many are waiting for an invitation to

volunteer. What is needed is a partnership with parents, dedicated to the common interest in the welfare and education of children.

School Environment

One major effort in a system-wide approach to improving learning should be to upgrade the physical facilities. In Oakland, we engaged in a massive program of rehabilitation and construction, reaching every school building built before 1950. Old, run-down, drab schools were completely renovated and modernized into attractive and functional centers for learning. In many schools, the transformation has been almost miraculous, and the communities have responded with a new pride and enthusiasm for their schools.

Vandalism is one of the most pernicious conditions affecting schools. Not only does it create a negative learning environment and destroy valuable facilities and equipment, it also diverts badly needed dollars from instruction. To address this, in Oakland we created an anti-vandalism incentive program. After determining a vandalism cost for every school, the schools were assisted in developing a multifaceted program attacking vandalism, both during and after schools hours. The incentive for the school was that a portion of the money saved by reducing vandalism was given to the school to use in whatever way desired to improve the educational program. We are now in the process of replicating this program in Chicago.

In Oakland and Chicago, we also developed a system-wide uniform code of discipline to ensure that disciplinary actions are based on misconduct rather than race, ethnic background, or economic status of

the student. We have clearly defined unacceptable behavior and have specified the appropriate response to each type of behavior. This code has become a powerful factor for creating an orderly atmosphere in the schools.

Monitoring of Principals/School Operation

Most people behave in relation to expectations, inspiration, information, and accountability. It was our intent to provide all four and to monitor and assess what effect they had. Monitoring, like evaluation, is or should be a constructive process aimed at improving the program through behavior. In keeping with this, each principal was furnished a monitoring guide predicated on the plan of action and the learning standard. Each area superintendent was charged with monitoring the principal and the operation of the school. After the first year, systematic monitoring from the area offices and the curriculum staff was a standard part of the operation.

Evaluation of Students/Program

To complement the learning standard, criterion referenced tests were developed that were enormously helpful in giving feedback to teachers and principals about the status of their program. Annually a major presentation was made on the results of the criterion referenced tests and the standardized tests to the public and the Board of Education. Each year as the students progressed, teachers became more and more confident and committed. When the school system reached the national norm, the reaction of the public and the staff was one of exhilaration. They knew it had been worth the effort.

INSTRUCTIONAL FACTORS

Programs to Enhance Student Motivation

Learning requires not only a well-designed program of instruction, capable teachers, a competent principal, and school organization, it also requires willing students. In many schools, motivation is of little concern because the students come to school from homes and communities in which the value of education is recognized. However, for many inner city children, caught in a world of poverty and racism, the values of education are neither apparent nor inculcated. These students have had little to emulate and have little experience with success. Therefore, we developed some programs intended to deal with these concerns on a system-wide basis.

In my first year in Chicago, we have been replicating these Oakland programs and they are proving to be at least as effective in Chicago as they were in California.

The first is what we call the Scholar/Artist Program. We invite nationally recognized individuals who have achieved recognition to talk with our students. These scholars or artists are living proof that, despite poverty, overwhelming odds, and other handicaps, it is possible to be successful. In order to participate in the forums with these visitors, students must study the lives and works of the scholar or artist.

This program serves to show students, in an immediate and personal manner, that they can make their dreams a reality. In short, these national figures become role models for our students.

Role models are one of the values of another program, the Adopt A School Program, a program originally conceived in response to criticism from the business community. In this program, businesses and institutions are invited to "adopt" a school, specifically developing a particular learning program that meets a need of students in that school and at the same time building upon the resources of the company or institution. Such adoption brings money and material, as well as personnel, into school. In addition, students are given an opportunity to meet and work with other adults who are successful in the world of work.

The third program for enhancing motivation is the Oakland Scholars Program, a program designed for students who were failing to reach their full potential. These bright students from poor families were each assigned a mentor and a goal to reach before the end of the school year. Those who reached their goals were inducted into the Oakland Schools' Hall of Fame in a special ceremony. This program has been extremely successful in motivating underachievers and has also improved the achievement of more successful students.

Mastery Learning

Another special program we have started is the Chicago Mastery Learning Reading Program*. The underlying assumption of this program is that all children can learn to read and to understand what they read. It may take some children longer than others, but all children will be

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* See Attachment 1 for "Questions and Answers About the Chicago Mastery Learning Reading Program."

given an efficient means to master reading.

In Chicago, we have a particular need to bring large numbers of students up to grade level who have fallen behind. Although the concept that all children can learn to read is hardly a revolutionary idea in a society dedicated to democratic ideals, it has been ignored, for the most part, in American public education. Indeed, most public schools build their educational programs around the concept that intelligence, to the extent it may be measured, is an immutable, individual characteristic.

Starting with the 1981-82 school year, Chicago introduced the Mastery Learning Reading Program into all its elementary schools (300,000 students). One should note the program was in use in Dallas, Kansas City, Philadelphia, New York, and numerous other urban and suburban communities.

The program can be described briefly as one that systematically leads children to mastery of a continuum of word attack, study skills, and comprehension objectives and, at the same time, explicitly teaches the thinking process required to learn and apply the skills. More specifically, each skill "sequence" is introduced and guided by the teacher. The materials provide students with step-by-step practice and regular reviews, as well as visual aids and other learning supports. The supports are gradually withdrawn as students are encouraged to think systematically while reaching their learning objective. A "test," really a diagnostic evaluation for each student, reveals who has and who has not mastered the task. For non-mastery students, additional

activities that approach the same skill objectives from a different prospective offer another chance for success. The students who master the unit have the opportunity to extend their new skills in a variety of challenging applications. Thus, the program makes every effort to advance mastery students while non-mastery students are receiving additional instruction.

In conclusion let me make clear that the factors I have discussed, community, school, and instructional, are not the only factors but simply the most significant ones superintendents must consider in their efforts to improve the teaching of basic skills. Further, let me make clear that by putting forth such efforts, public schools will not only improve the teaching of basic skills but also improve their image and, more important, the lives of their students.

QUESTIONS AND ANSWERS ABOUT CHICAGO MASTERY LEARNING READING PROGRAM (CMLRP)

QUESTION: What is Mastery Learning and how does it differ from traditional instruction?

Although there are many differences, three are outstanding. Mastery Learning, first of all, is a philosophy which assumes that all or nearly all children can learn. This differs sharply from traditional assumptions that achievement is normally distributed so that some children are bright, while others are only of average or low ability; i.e., some will learn and others will not. Second, whereas traditional instruction involves a two-phase teach/test cycle of instruction, Mastery Learning involves a four-phase, teach/test/reteach/retest cycle of instruction for each learning unit. The heart of this cycle is that students who do not learn the first time are retaught the same skills in a different way. In traditional instruction, learning errors are accumulative and low-achieving students may be increasingly less well-prepared for the next unit of instruction. Finally, Mastery Learning instruction is addressed to the very specific objectives, and mastery of each objective is tested before proceeding to the next lesson.

QUESTION: CMLRP staff say that the program is successful in terms of teacher use and student gains. What data are there to support that claim?

- The field test study of ten CMLRP classrooms using grade 3 materials matched to ten classrooms using the basal (1975-76)
- The field test study of 116 teachers using grade 3 and 4 materials matched to 116 control teachers (1976-77)
- The field test study (1977-78) of selected units from grades 5-8 involving six CMLRP classrooms in two schools matched to six control classrooms plus field analysis in two additional classrooms (See Jones, Monsaas, Katims, 1980; Jones, 1981)
- The use of selected materials from grades 3-8 with summer school students in the 1978 mandatory summer school for 10,000 eighth year students and 20,000 Title I students (Jones and Katims, 1980; Research and Evaluation Technical Report, 1980)

- The use of the same materials in the 1979 summer schools involving about 20,000 students (Jones and Katims, 1981)

- The use of grades 3-6 materials districtwide in District 19 in New York City in 1979-80 and 1980-81 (District Superintendent's report available.)

- The pilot study in Philadelphia of grades 5 and 6 materials in five Philadelphia classrooms in 1979-80, expanded in 1980-81

- The pilot study in Kansas City of six classrooms using materials for grades 5 and 6 in 1980-81, expanded to 50 classrooms in 1981-82 (Report available.)

- The pilot study in Dallas of K-2 materials districtwide in 1980-81 in the Oakcliffe district, expanded to districtwide use of K-4 materials in 1981-82

- The use of CMLRP materials at May Elementary Schools in Chicago for 1978-79, 1979-80, 1980-81 (See Katims and Jones, 1981)

QUESTION: Have there been any external evaluations of CMLRP materials?

- Dr. Francis Chase, Director, Urban Studies Team, headed a ten-member team of professional evaluators and curriculum specialists from other schools (including Detroit and Philadelphia) to study grades 3-6 CMLRP. After five days of study of reports, classroom observations, and interviews with teachers, administrators, and students, they concluded that CMLRP was highly effective and successful and that maximum effort should be made "to institutionalize CMLRP" (presentation March, 1979. See also Urban Studies Team Report, 1979.) This evaluation was sponsored by the National Institute of Education (NIE), the Spencer Foundation, and the Council for Great City Schools.

- NIE selected CMLRP materials for grades 5 and 6 as exemplary for their application of basic research on learning and reading. CMLRP was selected as one of five curriculum projects in the area of reading comprehension to be studied by NIE and LRDC (Learning Research and Development Center, University of Pittsburgh) at a joint NIE/LRDC invitational conference on learning and thinking skills in Pittsburgh, October, 1980. They appointed a team from the Center for the Study of Reading to analyze the quality of instruction in CMLRP. (See Campione and Ambruster, 1980; Jones, Amiran, and Katims, 1980; Thompson, 1980.) The proceedings from the conference will be published in spring, 1982.

- In summer, 1981, Levine (University of Kansas) and Stark (free-lance evaluator and Board member, Kansas City Schools) studied CMLRP implementations in New York and Chicago, funded by a grant from NIE. Levine has also strongly recommended CMLRP use to courts and school boards.

QUESTION: What inservice procedures were conducted to implement CMLRP?

Between 1975 and 1981 about 4,000 teachers and administrators were inserviced to use CMLRP materials in citywide, summer school, and school inservices. Since September, 1981, CMLRP staff have (1) trained six trainers to train 250 presenters for the citywide inservices involving all teachers, (2) all elementary teachers were shown a one-hour videotape on use of the materials the first day of school, (3) all teachers have participated in half-day inservice program, (4) inserviced teachers and principals in about 300 visits to over 200 schools in meetings lasting from 30 minutes to 3-4 hours, (5) met with parents in schools, at the Board of Education, and PTA meetings at night.

QUESTION: Why is the Board revising the materials?

All educational programs are being revised, updated, and improved continually. The reason is that these are living, growing programs that deal with changing circumstances. Students change. Teachers change. Time changes. Programs must change as well. All of the material in this program found to be objectionable in being revised. Why? Because any program of this magnitude--in this case, a program spanning 5,000 pages encompassing more than 150 reading skills from kindergarten through eighth grade--is being revised and updated and improved continually. Further, none of the material which some parents claim is objectionable is intrinsic to this program. This is a program to teach children to read; the specific reading materials are entirely collateral.

QUESTION: What revisions will be made and by whom?

Mastery Learning Reading staff will be assisted by seven Chicago teachers-on-loan (1) to rewrite and re-field test grades 3 and 4 materials and (2) to revise grades K-2 and 5-8 regarding content, vocabulary, format, testing, and instruction. All revisions will be made under the supervision of Mrs. Mattie Williams, Director, Bureau of Language Arts. Revisions will be based on comments made by teachers, administrators, and parents on forms issued by the Board on November 3, 1981, and again on January 6, 1982. Additionally, the newly appointed district instructional coordinators will assist CMLRP staff as critics,

editors, and writers as well as help in the field test process and in obtaining comments from parents and school staff. Individual teachers and parents will also help in this process. The Board has devoted maximum staff and effort to respond fully to teachers' and parents' concerns.

QUESTION: What are the credentials of the writers of CMLRP?

All writers have been teachers at some point. Some writers were free-lance fiction writers and developers. Others were a mastery learning expert; a remedial reading clinician; or specialists in reading, learning disabled, mentally handicapped, gifted, or Teachers of English as a Second Language. All were college graduates, several having MA's or PhD's. Three persons moved from other cities in order to work on this project, one of whom was asked to come by her superintendent to serve as an apprentice to learn how to construct and field test materials like CMLRP for her school system.

TECHNIQUES TO RAISE URBAN STUDENTS' STANDING ON STANDARDIZED TESTS

John L. Crew, Sr.
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Baltimore City Public Schools

I. Background Information

In 1975, Dr. John L. Crew, Sr., was appointed Superintendent of the Baltimore City Public Schools. The school system at that point was comprised of 166,000 students. It had lost 27,000 students in the previous six years, and occupied over 200 buildings, some of which predated World War I, housing students from kindergarten through adult education programs.

The years preceding his appointment had been marked by several dramatic events that placed great strain on the system. In February, 1974, the system was ordered to implement a desegregation plan which involved a significant amount of movement of students and staff throughout the system. That same year, there was a systemwide teacher strike and six months later, in July, 1975, the former superintendent was replaced. The achievement levels of the students had been in a consistent state of annual decline for the previous several years as measured by the Iowa Test of Basic Skills. Graph I A and I B show the status of standardized test results in reading comprehension and math total for grades 3, 5, 7, and 9 for 1969-1975: they reflect a consistent pattern of decline in test scores at all grade levels, with grades 7 and 9 showing the sharpest rate of decline during those years; they also reflect that

the ninth grade was two years behind national norms in both reading comprehension and mathematics in 1975. (See Graphs I A and I B).

In November, 1975, a joint conference of educators and employers of Baltimore City produced a long list of learning deficiencies of high school graduates noted by major employers of the city. Business interests were joined by representatives of local colleges and universities in pointing out the additional efforts that they had to expend in providing remediation for the students. Staff morale was at an all time low.

II. Statement of Problems

To find a way to reinstate the credibility of the school system was of immediate concern. The route chosen was to bring about an improvement in the achievement levels of our students on standardized tests. The first axiom was that if there are no measures of what one is doing, then one is vulnerable to any attack questioning one's success. Consequently, all the steps that would follow would involve a carefully planned measurement system.

III. Objective

The major objective was to have students improve their skills in reading, writing, and mathematics. To determine the extent to which this objective was achieved, the number of students operating at or above national norms on standardized tests was computed for each grade.

IV. Procedure for Achieving Objective

To reach such an objective required the interaction and coordination

of several major divisions of the organization including teaching staff, curriculum and supervisory staff, personnel staff, research staff, data processing staff, guidance and pupil services staff, and key administrators. Key to all of this had to be the complete understanding and support of the School Board for all facets of the plan. Steps taken were as follows:

A. Curriculum Development

It was decided to express the curriculum in very straightforward statements of expectations for each grade in reading, writing, and mathematics. These "Grade Level Expectancies" were lists of skills to be taught in each grade and were developed by teachers and curriculum specialists and distributed to all teaching staff through 1976-77 with accompanying orientation and staff development activities. It should be noted that the expectancies reflected skills identified in graded textbooks of major publishers and graded problems of standardized tests. The school system did not want to set expectations unreasonably high or low.

B. Proficiency Test Development

The next step was to develop proficiency tests of the expectancies (skills) for grades 1-9 in writing, grades 3-8 in mathematics, and grades 3-9 in reading. The purpose was to measure discrete skills that were taught with the expectation that if students could do well on tests based on the school's curriculum, they would also do well on standardized tests which

tend to measure similar combinations of skills rather than discrete skills. For example, a standardized test question might be the following:

> "Using the addends 18 and 27, name the numeral in the tens place of the sum."

Such a question requires the student to apply the following skills:

1. Add two single digit numerals with regrouping
2. Add two single digit numerals without regrouping
3. Know the meaning of "addend"
4. Know the meaning of "sum"
5. Know the place names
6. Identify the tens place

The question embodies six basic skills. If a student were to miss the question, it would not be known which skill(s) the student had mastered.

The proficiency tests were designed to isolate these skills with discrete questions on each skill and were intended to serve two purposes. First, they were intended to certify students who possessed some minimal level of knowledge and skills. Second, for students not possessing this minimum level, the proficiency tests were intended to identify fairly specific learning deficiencies. The proficiency tests were field tested pre and post in 1976-77 and 1977-78.

C. Course Placement

Based upon results obtained from proficiency tests, differentiated courses were designed in order to afford students appropriate remediation. For example, students who scored under

40% on the reading test would, in addition to taking a course entitled "English With Reading Emphasis," also be assigned to a reading laboratory with approximately 20 students for one period each day. The purpose of the course was to provide intensive instruction in the areas of reading and functional writing. The reading laboratory provided opportunities for students to make needed improvement in basic reading skills, to adapt to different types of reading, and to extend their skills and abilities in functional, recreational, and critical reading. Instead of an elective these students stayed in the reading laboratory course until their proficiency test scores improved. In mathematics, basic skills were emphasized for students who did not pass the Mathematics Proficiency Test for their grade. Because the State of Maryland requires only two Carnegie Units in mathematics, which students normally have taken by the end of grade 10, the School Board chose to exceed the state requirements and require juniors and seniors who had not yet passed the Mathematics Proficiency Test to take additional courses on a semester-by-semester basis until such time as they passed the test. These courses entitled "Applied Math Fundamental Emphasis" and "Fundamentals of Mathematics" were individualized to meet student needs in attaining basic proficiency level in mathematics. These students also lost electives.

D. Staffing

Naturally, the creation of additional reading and mathematics courses affected the distribution of teaching staff, requiring more teachers in remedial areas and fewer in elective areas. Reading and mathematics teachers were assigned to schools on a differential basis, based on student scores on the proficiency tests and subsequent course placements. The school system hired additional reading teachers. This did not involve a significant expansion of staff because students taking the above courses were not taking electives and, therefore, a reduction of teachers of electives was accomplished through normal attrition and reassignment where possible. For example, a demand for foreign languages was created in the elementary schools by reassigning 11 displaced tenured secondary foreign language teachers to that level. The demand for languages in elementary schools was such that the instructional staff is presently developing a long-range plan to make foreign languages a required part of the curriculum. Some elementary teachers who were surplus (because of our shrinking population) were retrained and reassigned to the secondary level to teach reading and remedial mathematics. The school system was assisted in this retraining effort by a local university.

E. Supervision

In addition to school-based supervision provided by principals, secondary department heads, and elementary senior

teachers, a systemwide program of supervision was provided by the central office instructional divisions. Direct classroom observation of staff and one-to-one supervision of teaching staff was designed to bring about increased attention to the management of specific educational objectives and maintenance of a positive classroom learning climate. Thus, the observation procedures have had an increasingly positive effect on the use of the curriculum as well as on teacher behavior and methodology. Specifically, the following was undertaken:

1. At the secondary level, educational specialists certified in their specific subjects, provided assistance to junior and senior high school teachers.
2. At the upper elementary level in grades 4, 5, and 6, two teaching clusters were created in order to give the teacher fewer preparations and allow a greater degree of specialization. Cluster I was language oriented instruction. A Cluster I teacher taught two groups, one in the morning and one in the afternoon. A Cluster II teacher (mathematics/science) taught these same two groups of students in reverse order, afternoon/morning. The elementary supervisory staff was organized on the same two cluster model, thus providing more specialized, technical supervision in content areas.

F. Computerized Reporting

A computerized scoring and reporting procedure was implemented for the proficiency testing program (except for writing which is hand-scored). Each teacher received a class roster report of proficiency test results categorized by student, by item, and by distractor. Students who chose the same incorrect distractor could be identified easily and grouped for remediation of specific skills. For example, students who failed to "carry a one" in an addition problem could be identified and have this skill addressed by the teacher. The computer also generated reports by grade, by school, and by system and was tied to the master pupil file. It is indeed a "state of the art" reporting system for use of data at all levels of decision making. Such data were used, for example, to correct obvious discrepancies in the old promotional procedures which showed a disparity between the elementary level where the promotional rate was very high but the achievement rate levels were low, and the secondary level where the promotion rates were very low and obviously caused by the high influx of underprepared students into the secondary schools. Elementary school promotional decisions are now based on a composite of teacher grades and proficiency test scores. Any student showing less than 70% proficiency must be given additional remediation. At the secondary school level, the passing of subjects and proficiency tests was also

tied to promotional considerations. Non-passers were given required remedial course placements instead of elective choices.

G. Promotion and Graduation

After each of the above elements was in place, the time came to put teeth into the design by incorporating consideration of the students' proficiency test results into decisions for promotion and graduation. The schools could not have withheld a diploma without assuring appropriate curriculum, course placement, remediation, staffing, and test validity. The passing of all proficiency tests as a graduation requirement was announced in spring, 1978, and went into effect for the Class of 1979. History showed that approximately 5% of the seniors traditionally did not receive diplomas. As a result of the new policy, 12% of the Class of 1979 had their diplomas withheld. Much of the 7% increase in failure was explained by teachers raising their standards for students to pass their courses when they saw that students did not do well on proficiency tests. This validated our earlier findings that students were being graduated who lacked basic skills in reading, writing, and mathematics. The test scores served to give teachers a reference point or benchmark. New respect and meaning were given to the high school diploma by the public, staff, and students. A Promotion Committee was formed at each school to aid in promotion/graduation decisions. These committees, composed of school-based staff, added a human

element to individual promotion decisions and took mitigating circumstances into account, particularly student achievement that might be demonstrated in ways other than test scores. The committees were given the authority to waive test-score requirements of students within one standard error (above five points) of the passing score of 70%. This helped to eliminate "false negatives." (A false negative is a student whose test performance indicates he or she has failed although he or she actually is competent.)

V. Results

The results of this program began to take effect earlier and faster than expected. The ten-year decline in test scores halted in 1976-77. Following that year, there has been an accelerated movement of scores toward the national norm each spring.

Closer examination of recent results demonstrate continued progress toward the norm at each grade as the total program took hold and became more refined. Scores on reading comprehension (Graph II A) and math total (Graph II B) show accelerated increases towards norm standards at all grade levels. The system changed from the Iowa Test of Basic Skills to the California Achievement Test in 1976. In spring, 1981, grade 5 was above the national norm in mathematics, and grades 3 and 7 were close to achieving the national norm in mathematics (Graph II B). In reading comprehension, the ninth grades showed more than two years' growth and were within a few months of the norm (Graph II A).

The pattern of improving scores can be noted across all grade levels. Graphs III A and III B show that over an eleven-year period the trend of declining scores was reversed in 1976 and that students began to show improvement in scores on standardized tests in a dramatic fashion since that year. Graph III C shows the same pattern for grade 11 scores, with both reading comprehension and math total scores now reported above the national norm.

Although Table III D and III F still show grades in spring, 1981, that have mean grade equivalent scores below the national norm, the results shown in Table III E make clear that the scores of all grade levels are accelerated beyond that established by the norm. Reading comprehension results show Grade 11 above the norm and several grades are shown closer to the norm than previously (See Table III D). The projections for spring, 1982, indicate the system's expectations that six grades will be able to achieve at levels at or above the norm in reading comprehension and seven grades will be able to do so in mathematics (Table III G). Additionally, those grades still below the norm will have moved even closer to achieving the standardized norm levels.

VI. Conclusion

A new climate pervades the Baltimore City Public Schools. Students and staff take their work more seriously. The community and city fathers support the schools' efforts; the system has set standards and held to them without a single lawsuit.

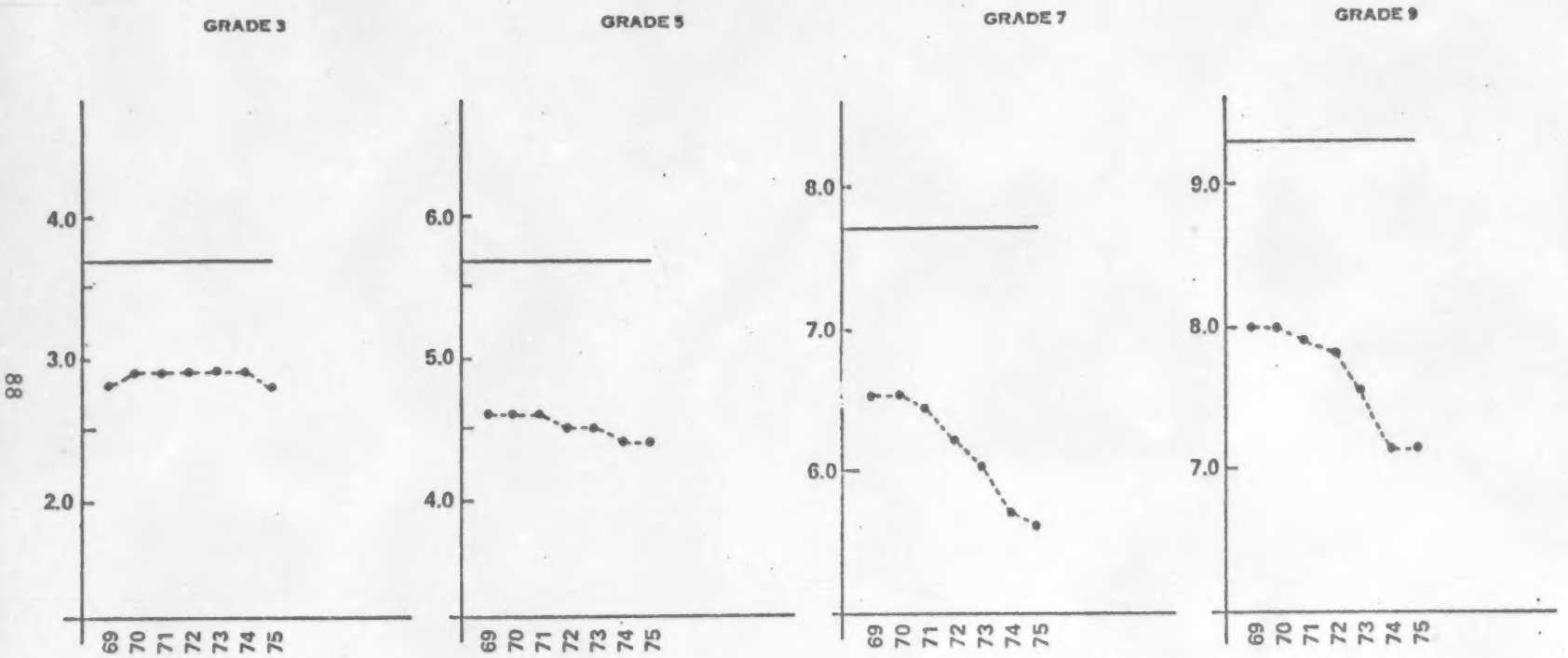
The adoption of a set of well defined grade level learning expectancies,

the development of a comprehensive measurement system to test the attainment of the expectancies, and the provision of intensive remediation for students with identified learning deficiencies are procedures that have been instrumental in helping the school system reach its goal of improving student achievement. The support given instructional personnel through staffing and supervision changes, as well as the incorporation of a computerized reporting procedure, also has supported the movement of the school system to greater excellence. By tying together all of the elements noted above into a mutually reinforcing set of policies and procedures, the Baltimore City Public Schools has created a comprehensive approach to instructional improvement that has produced measurable results.

ATTACHMENTS

I.	A.	Graph: Reading Comprehension	1969-1975
	B.	Graph: Math Total	1969-1975
II.	A.	Graph: Reading Comprehension	1976-1981
	B.	Graph: Math Total	1976-1981
III.	A.	Graph: Reading Comprehension	1970-1981
	B.	Graph: Math Total	1970-1981
	C.	Graph: Grade 11 Reading Comprehension Math Total	1978-1981
	D.	Table: Long Term Trends Reading Comprehension Math Total	1978-1981
	E.	Table: Standardized Test Results	1980-1981
	F.	Table: Standardized Test Results	1970-1981
	G.	Table: Comparison of Standardized Test Results to Norm Standings	1977-1981 (Spring 1982 projections)

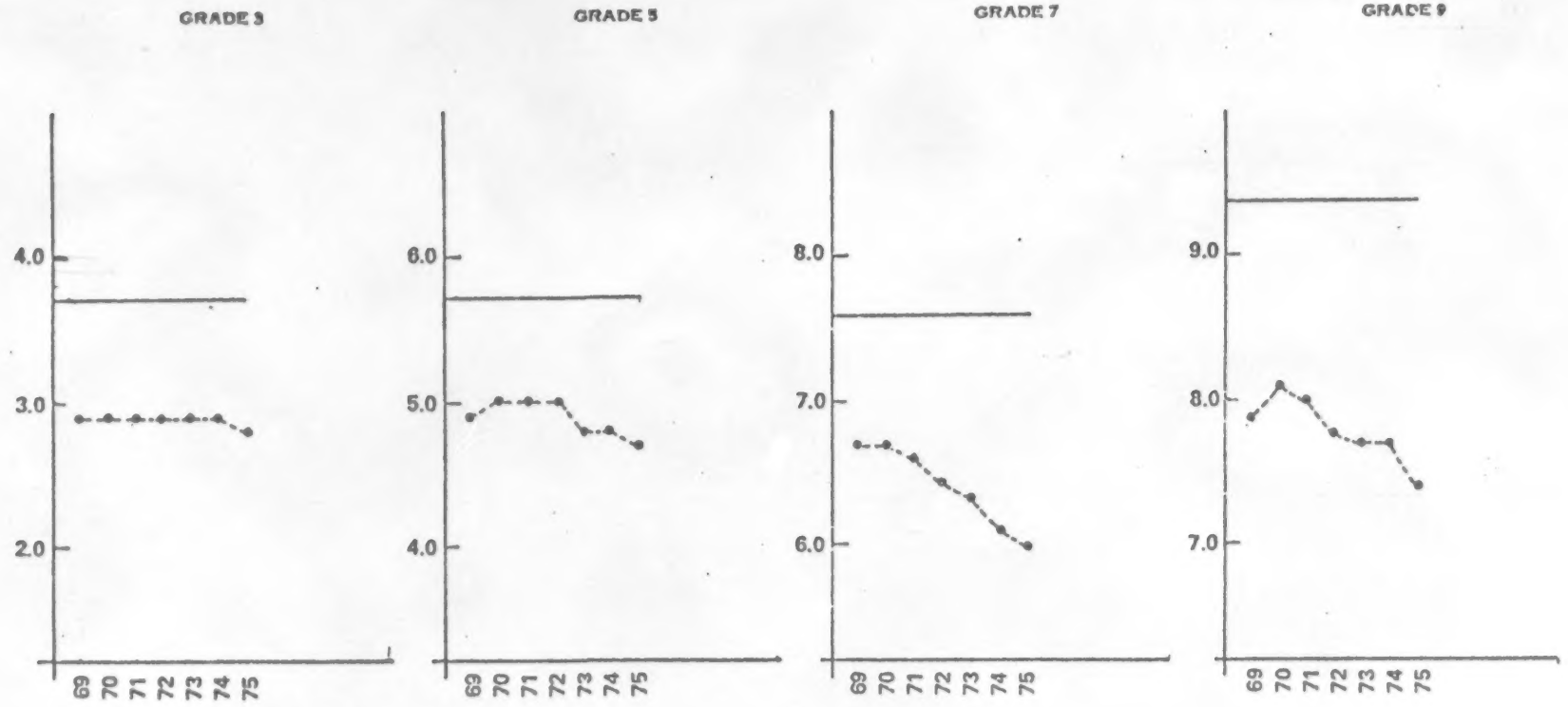
1969-1975
READING COMPREHENSION



Spring Grade Equivalent Norm—ITBS
Grade Mean Scores

Graph I - A

Math Total 1969-1975



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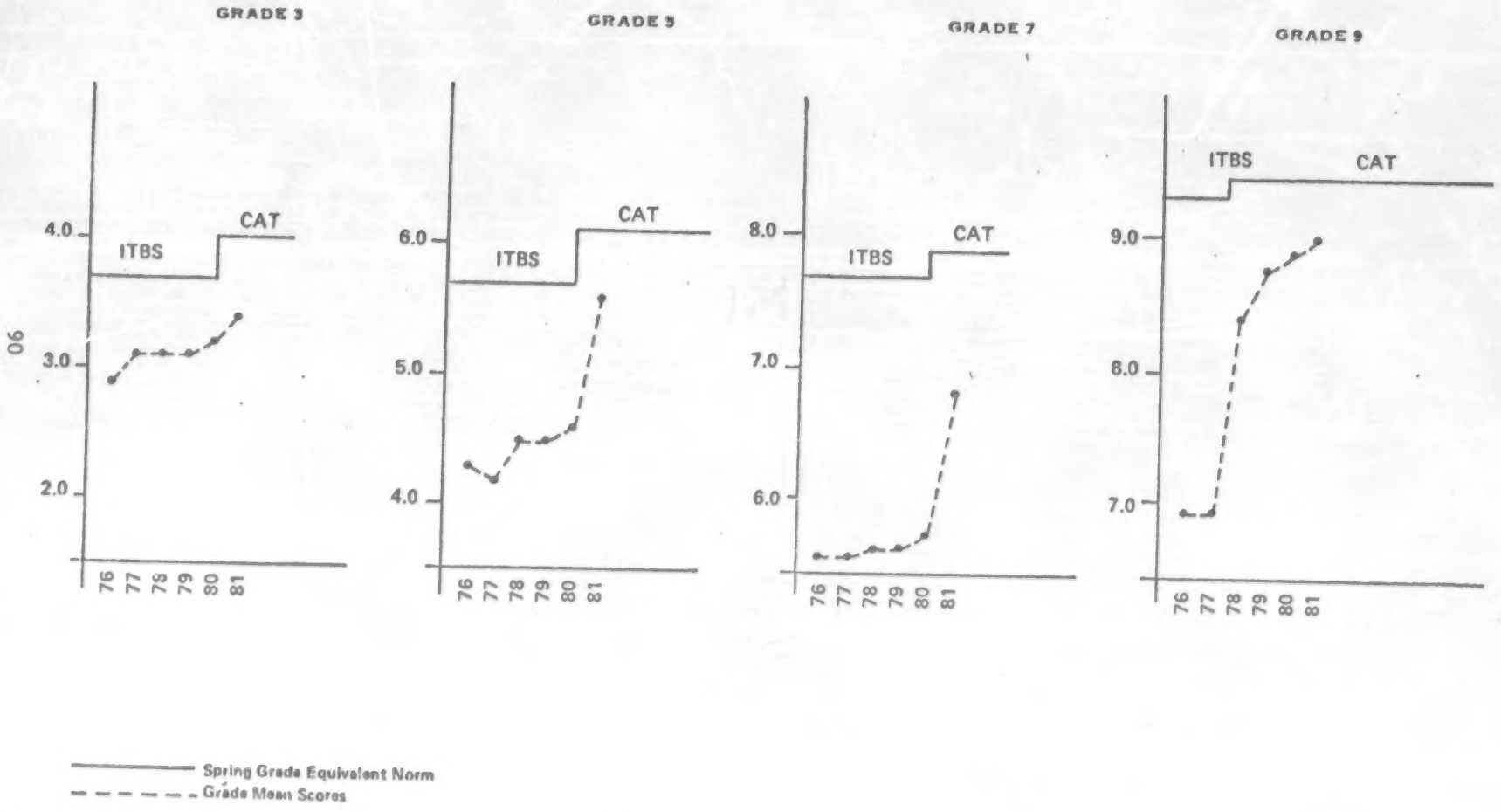
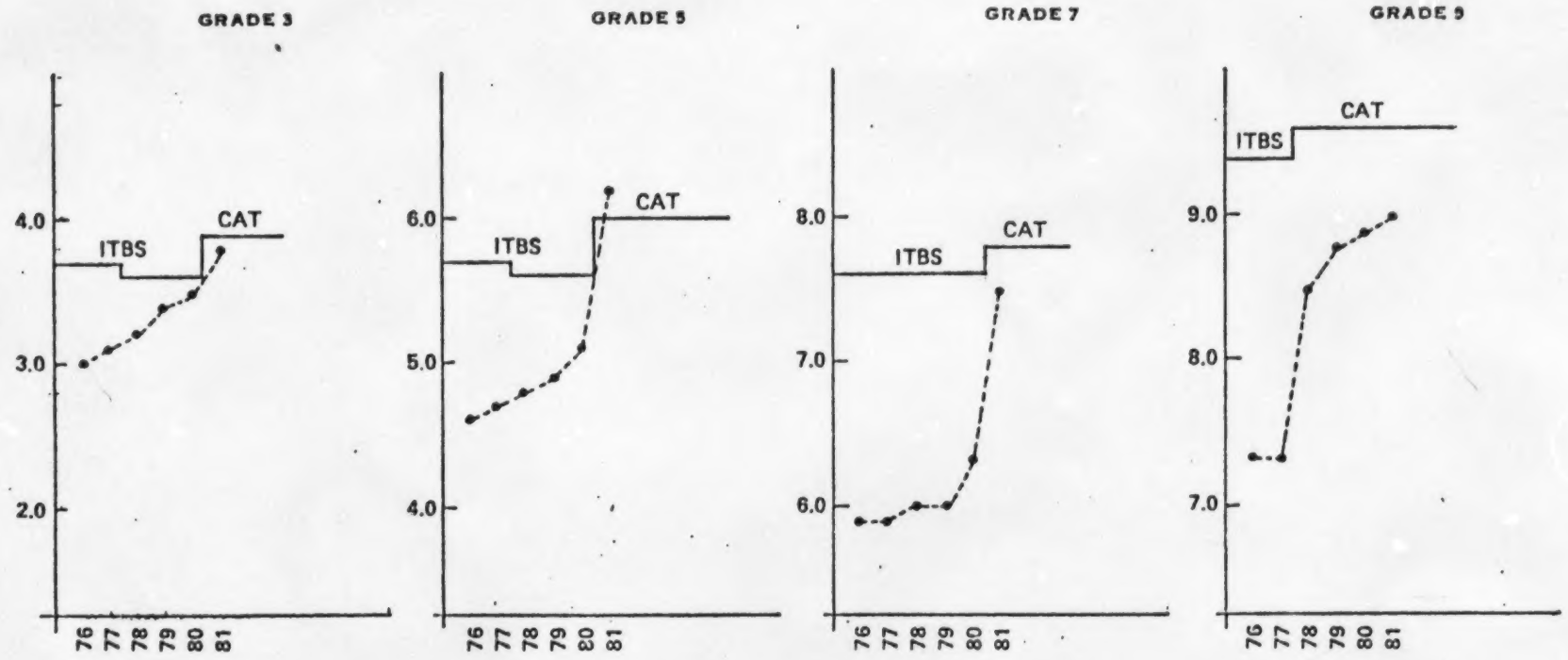
Graph I - B

1976-1981
READING COMPREHENSION



Graph II - A

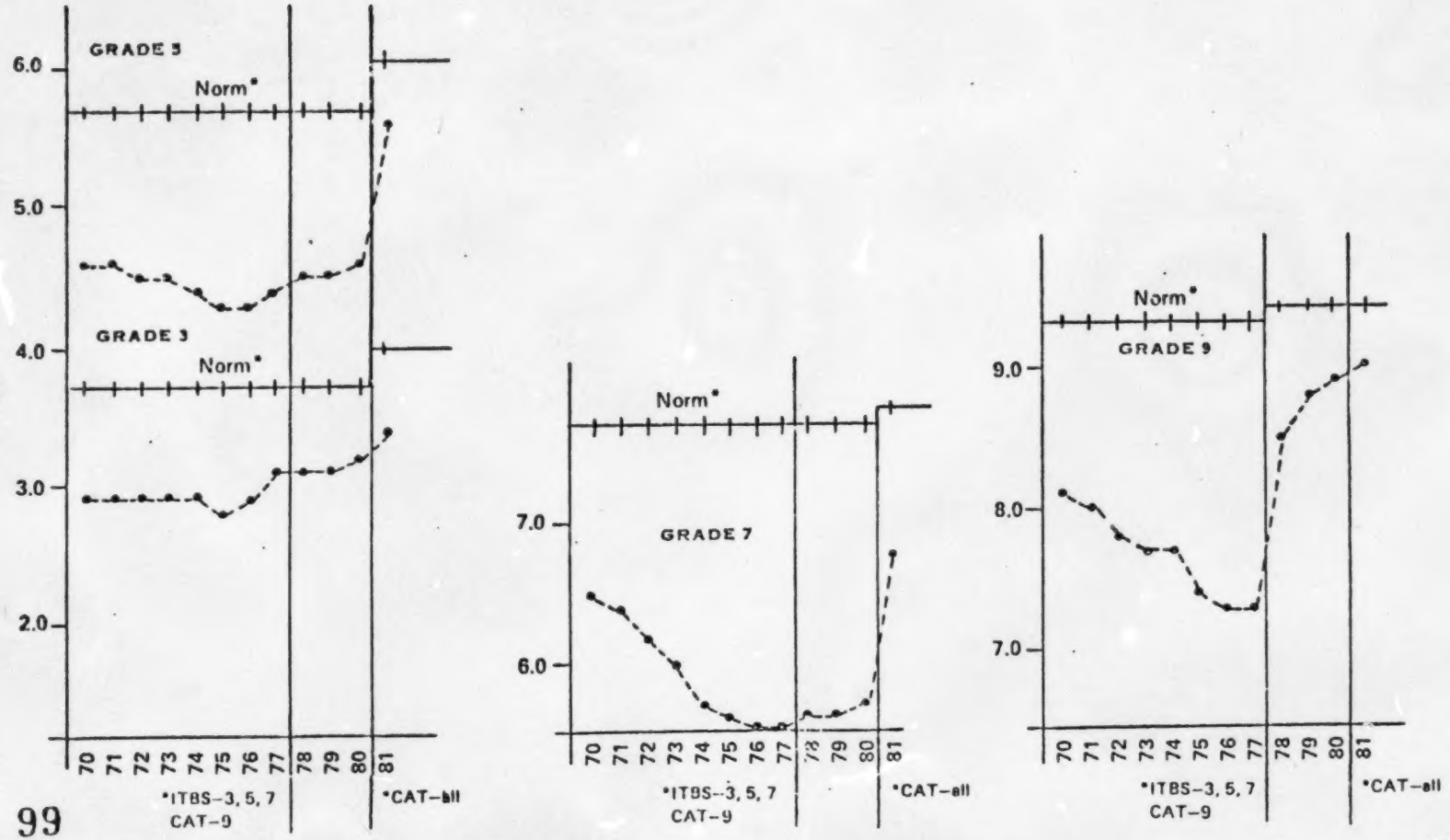
1976-1981
MATH TOTAL



———Spring Grade Equivalent Norms—ITBS or CAT as Indicated
------Grade Mean Scores

ITBS–	1976-1978	Grades 3, 5, 7, 9
	1978-1980	Grades 3, 5, 7
CAT–	1978-1980	Grade 9
	1981-Present	All Grades

1970-1981
READING COMPREHENSION
TEST RESULTS



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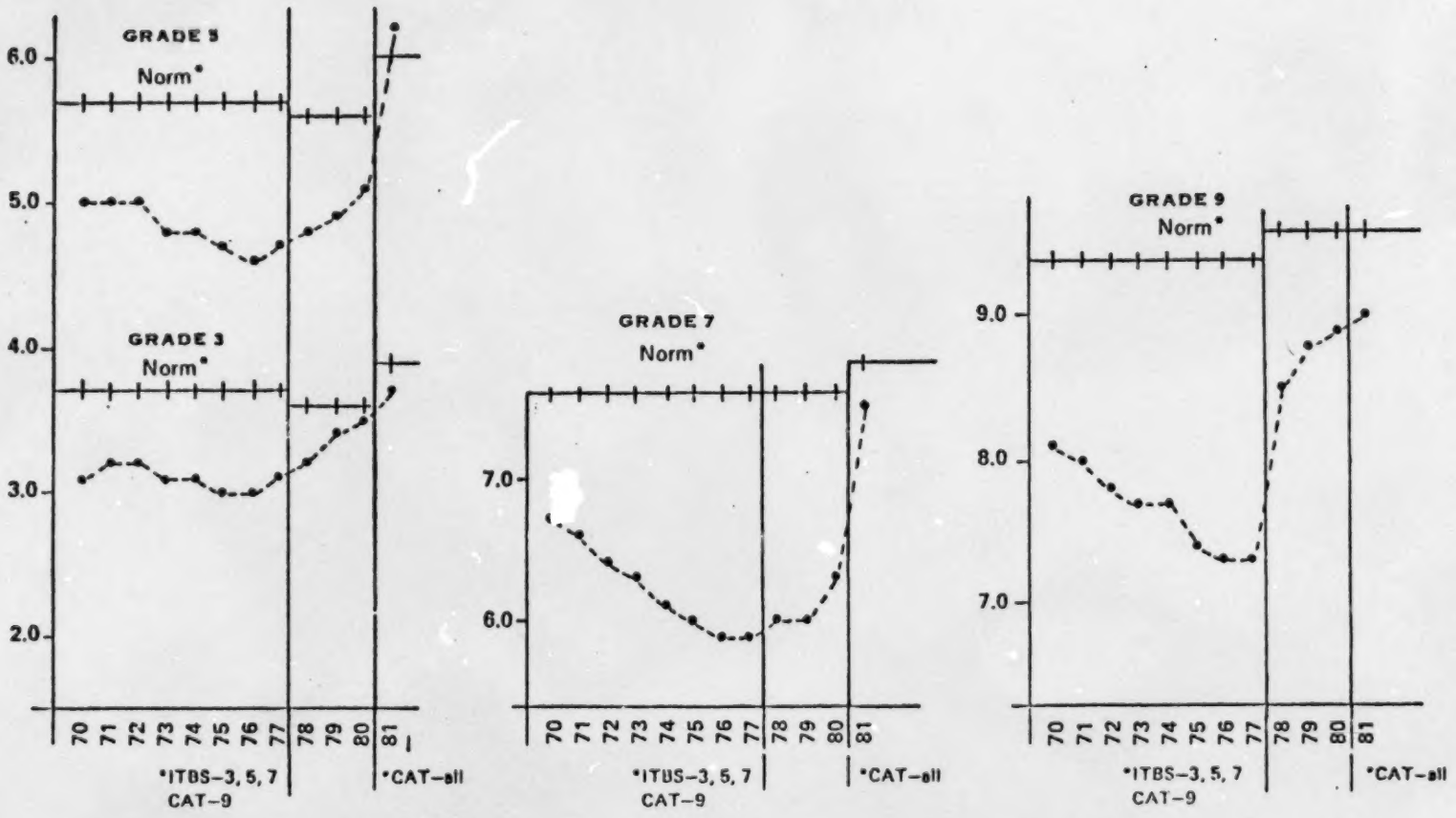
Spring Grade Equivalent Norm—ITBS or CAT as appropriate
Grade Mean Scores

100

Graph III - A

1970-1981
MATH TOTAL
TEST RESULTS



——— Spring Grade Equivalent Norm–ITBS or CAT as appropriate
– – – – Grade Mean Scores

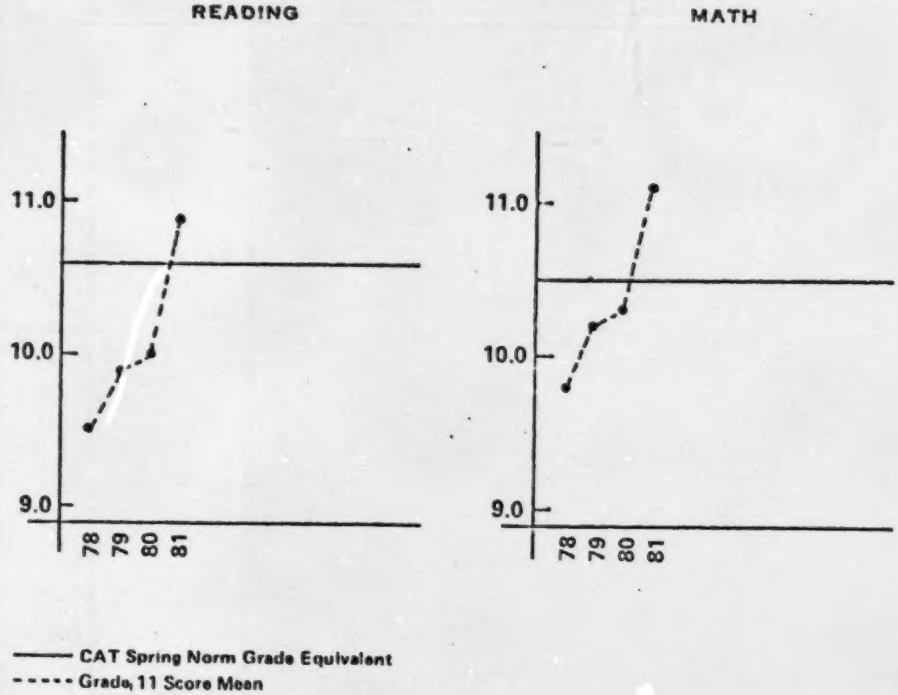
93

101

102

Graph III - 5

1978-1981
READING COMPREHENSION/MATH TOTAL
Grade 11



LONG TERM TRENDS IN READING COMPREHENSION

Test	Spring Nat'l Norm	Grade	Spring '78 G.E.	Spring '79 G.E.	Spring '80 G.E.	Spring '81 G.E.	Dist. From Norm Spr. '80	Dist. From Norm Spr. '81	Gain On Norm	Dist. From Norm Spr. '78	Dist. From Norm Spr. '81	Gain On Norm
CAT	3.0	2	2.1	2.2	2.4	2.6	-6 mo.	-4 mo.	+2	-9 mo.	-4 mo.	+5
CAT* ITBS	4.0 3.7	3	3.1	3.1	3.2	3.4	-5 mo.	-6 mo.	-1	-6 mo.	-6 mo.	0
CAT	5.2	4	4.0	4.3	4.5	4.4	-7 mo.	-8 mo.	-1	-12 mo.	-8 mo.	+4
CAT* ITBS	6.1 5.7	5	4.5	4.5	4.6	5.6	-11 mo.	-5 mo.	+6	-12 mo.	-5 mo.	+7
CAT	7.1	6	5.9	6.2	6.6	6.6	-5 mo.	-5 mo.	0	-12 mo.	-5 mo.	+7
CAT* ITBS	7.9 7.7	7	5.6	5.6	5.7	6.8	-20 mo.	-11 mo.	+9	-21 mo.	-11 mo.	+10
CAT	8.9	8	7.3	7.6	7.8	8.0	-11 mo.	-9 mo.	+2	-16 mo.	-9 mo.	+7
CAT	9.4	9	8.4	8.8	8.9	9.0	-5 mo.	-4 mo.	+1	-10 mo.	-4 mo.	+6
CAT	10.1	10	8.3	8.8	8.9	9.3	-12 mo.	-8 mo.	+4	-18 mo.	-8 mo.	+10
CAT	10.6	11	9.5	9.9	10.0	10.9	-6 mo.	+3 mo.	+9	-11 mo.	+3 mo.	+14

*Distances from the norm are shown for the California or Iowa tests as appropriate.

LONG TERM TRENDS IN MATHEMATICS

Test	Spring Nat'l Norm	Grade	Spring '78 G.E.	Spring '79 G.E.	Spring '80 G.E.	Spring '81 G.E.	Dist. From Norm Spr. '80	Dist From Norm Spr. '81	Gain On Norm	Dist. From Norm Spr. '78	Dist From Norm Spr. '81	Gain On Norm
CAT	2.9	2	2.4	2.6	2.9	3.0	-0 mo.	+1 mo.	+1	-5 mo.	+1 mo.	+6
CAT* ITBS	3.9 3.6	3	3.2	3.4	3.5	3.8	-1 mo.	-1 mo.	-	-4 mo.	-1 mo.	+3
CAT	4.9	4	4.1	4.4	4.7	4.9	-2 mo.	0 mo.	+2	-8 mo.	0 mo.	+8
CAT* ITBS	6.0 5.6	5	4.8	4.9	5.1	6.2	-5 mo.	+2 mo.	+7	-8 mo.	+2 mo.	+10
CAT	6.9	6	6.0	6.4	6.9	7.4	-0 mo.	+5 mo.	+5	-9 mo.	+ 5 mo.	+14
CAT* ITBS	7.8 7.6	7	6.0	6.0	6.3	7.5	-13 mo.	-3 mo.	+10	-16 mo.	-3 mo.	+13
CAT	9.0	8	7.4	7.6	8.0	8.4	-10 mo.	-6 mo.	+4	-16 mo.	-6 mo.	+10
CAT	9.6	9	8.5	8.8	8.9	9.0	-7 mo.	-6 mo.	+1	-11 mo.	-6 mo.	+5
CAT	10.1	10	8.9	9.4	9.4	10.0	-7 mo.	-1 mo.	+6	-12 mo.	-1 mo.	+11
CAT	10.5	11	9.8	10.2	10.3	11.1	-2 mo.	+6 mo.	+8	-7 mo.	+6 mo.	+13

*Distances from the norm are shown for the California or Iowa Tests as appropriate.

STANDARDIZED TEST RESULTS FOR 1980-81
READING COMPREHENSION

Grade	Fall '80 Grade Equivalent	Spring '81 Grade Equivalent	Norms Fall/Spring		Norm Growth Expected (in months)	Observed Growth
2	1.7	2.6	2.4	3.0	6	9
3	2.3	3.4	3.3	4.0	7	11
4	3.4	4.4	4.5	5.2	7	10
5	4.3	5.6	5.5	6.1	6	13
6	5.3	6.6	6.5	7.1	6	13
7	5.6	6.8	7.4	7.9	5	12
8	7.1	8.0	8.4	8.9	5	9
9	8.2	9.0	9.1	9.4	3	8
10	8.0	9.3	9.9	10.1	2	13
11	10.2	10.9	10.4	10.6	2	7

STANDARDIZED TEST RESULTS FOR 1980-81
MATHEMATICS

Grade	Fall '80 Grade Equivalent	Spring '81 Grade Equivalent	Norms Fall/Spring		Norm Growth Expected (in months)	Observed Growth
2	1.8	3.0	2.2	2.9	7	12
3	2.5	3.8	3.1	3.9	8	13
4	3.6	4.9	4.2	4.9	7	13
5	4.7	6.2	5.3	6.0	7	15
6	5.7	7.4	6.2	6.9	7	17
7	6.2	7.5	7.2	7.8	6	13
8	7.6	8.4	8.5	9.0	5	8
9	8.1	9.0	9.4	9.6	2	9
10	8.6	10.0	10.0	10.1	1	4
11	10.0	11.1	10.4	10.5	1	11

BALTIMORE CITY PUBLIC SCHOOLS

STANDARDIZED TEST SCORES 1970-1981
Reading Comprehension and Math Total

Grade		Spring Norm GE[a]	Spring 70	71	72	73	74	75	76	77	78	79	80	81
3	RC	ITBS 3.7 CAT 4.0	2.9	2.9	2.9	2.9	2.9	2.8	2.9	3.1	3.1	3.1	3.2	3.4
	M	ITBS 3.7 3.6[b] CAT 3.9	3.1	3.2	3.2	3.1	3.1	3.0	3.0	3.1	3.2	3.4	3.5	3.8
5	RC	ITBS 5.7 CAT 6.1	4.6	4.6	4.5	4.5	4.4	4.3	4.3	4.4	4.5	4.5	4.6	5.6
	M	ITBS 5.7 5.6[b] CAT 6.0	5.0	5.0	5.0	4.8	4.8	4.7	4.6	4.7	4.8	4.9	5.1	6.2
7	RC	ITBS 7.7 CAT 7.9	6.5	6.4	6.2	6.0	5.7	5.6	5.5	5.5	5.6	5.6	5.7	6.8
	M	ITBS 7.6 CAT 7.8	6.7	6.6	6.4	6.3	6.1	6.0	5.9	5.9	6.0	6.0	6.3	7.5
9	RC	ITBS 9.3 CAT 9.4	8.0	7.9	7.8	7.5	7.1	7.1	6.9	6.9	8.4	8.8	8.9	9.0
	M	ITBS 9.4 CAT 9.6	8.1	8.0	7.8	7.7	7.7	7.4	7.3	7.3	8.5	8.8	8.9	9.0
11	RC	CAT 10.6	N.A.-	———	———	———	———	———	———	——→	9.5	9.9	10.0	10.9
	M	CAT 10.5	N.A.-	———	———	———	———	———	———	——→	9.8	10.2	10.3	11.1
											ITBS grades 3, 5, 7 CAT grades 9, 11			CAT all grades

[a] ITBS or CAT norm as appropriate

[b] ITBS norms 1978-1980

BALTIMORE CITY PUBLIC SCHOOLS
Comparison of the Standardized Test Results in Relationship to
Norm Standings Between 1977 Through 1981
With Spring 1982 Projections

READING							MATHEMATICS						
Grade	Nat'l Norm		BCPS Fall'77		Months Below Norm 1977	Months Below Norm 1981	Spring '82 Projection	Grade	Nat'l Norm		BCPS Fall'77		Months Below Norm 1977	Months Below Norm 1981	Spring '82 Projection
2	3.0	-	1.6	=	-14	- 4	+ 2	2	2.9	-	1.6	=	-13	+ 1	+ 3
3	4.0	-	2.5	=	-15	- 6	0	3	3.9	-	2.7	=	-12	- 1	+ 1
4	5.2	-	3.2	=	-20	- 8	- 2	4	4.9	-	3.3	=	-16	0	+ 2
5	6.1	-	4.0	=	-21	- 5	+ 1	5	6.0	-	4.2	=	-18	+ 2	+ 5
6	7.1	-	5.0	=	-21	- 5	+ 1	6	6.9	-	5.0	=	-19	+ 5	+ 7
7	7.9	-	5.3	=	-26	-11	- 5	7	7.8	-	5.6	=	-22	- 3	- 1
8	8.9	-	6.5	=	-24	- 9	- 3	8	9.0	-	6.6	=	-24	- 6	- 2
9	9.4	-	7.6	=	-18	- 4	+ 2	9	9.6	-	7.7	=	-19	- 6	- 5
10	10.1	-	7.6	=	-25	- 8	- 2	10	10.1	-	8.2	=	-19	- 1	+ 3
11	10.6	-	8.8	=	-18	+ 3	+ 6	11	10.5	-	9.3	=	-12	+ 6	+ 6
					-202	-57	0						-174	- 3	+19
	Average:				-20.2	-5.7	0		Average:				-17.4	-0.3	+1.9